PACKAGE engineering

Techniques of using bag-in-box packaging

Two experts, pioneers in large-scale use of polyethylene bags in corrugated boxes, tell in detail for the first time, the steps leading to refinement and effective use of this packaging. (See Page 35)

Polystyrene for thermoformed packaging

Examining basic properties and practical applications of polystyrene with a closeup look at biaxial orientation and how it adds flexibility, toughness and strength to this material. (See Page 40)

What to do when short of sealing space

Lack of floor space for conventional equipment led to development of vertical compression in sealing end-opening cases, thus elevating cases to an automatic take-away, as well as saving space. (See Page 46)

Complete table of contents on Page 2

AUGUST 1959

Volume 4 • Number 8

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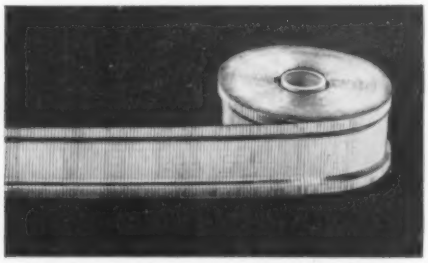

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For more information circle No. 202 on Reader Service Card, Page 72

For your calendar

August 17-21. AMA workshop seminar, "Costs and controls," Colgate University, Hamilton, N. Y. Contact: John L. Wood, American Management Association, 1515 Broadway, New York 36, N. Y. *Telephone: JUdson 6-8100.*

September 21-23. AMA orientation seminar, "How to set up and manage an economical fill control program," The Hotel Astor, New York, N. Y. Contact: John L. Wood, American Management Association, 1515 Broadway, New York 36, N. Y. *Telephone: JUdson 6-8100.*

September 28-30. AMA workshop seminar, "Packaging line layout," The Hotel Astor, New York, N. Y. Contact: John L. Wood, American Management Association, 1515 Broadway, New York 36, N. Y. *Telephone: JUdson 6-8100.*

October 1. Packaging Institute professional member meeting on packaging of dairy products, Sheraton-Blackstone Hotel, Chicago. Contact: Charles A. Feld, executive director, Packaging Institute, 342 Madison Avenue, New York 17, N.Y. *Telephone: MUrray Hill 7-8875.*

October 5-6. Purdue University conference on packaging specifications, Purdue University, Lafayette, Ind. Contact: Mark E. Ocker, Division of Adult Education, Memorial Center, Purdue University, Lafayette, Ind.

November 2-4. AMA packaging seminar, "Manufacturing's part in the overall packaging program," The Hotel Astor, New York, N. Y. Contact: John L. Wood, American Management Association, 1515 Broadway, New York 36, N. Y. *Telephone: JUdson 6-8100.*

November 2-4. AMA packaging seminar, "Printing on packaging," The Hotel Astor, New York, N.Y. Contact: John L. Wood, American Management Association, 1515 Broadway, New York 36, N.Y. *Telephone: JUdson 6-8100.*

November 9-11. AMA packaging seminar, "Fundamentals of packaging specifications," The Hotel Astor, New York, N.Y. Contact: John L. Wood, American Management Association, 1515 Broadway, New York 36, N.Y. *Telephone: JUdson 6-8100.*

November 16-18. 21st annual national packaging forum of Packaging Institute, Hotel Statler, New York, N. Y. Contact: Charles A. Feld, executive director, Packaging Institute, 342 Madison Avenue, New York 17, N. Y. *Telephone: MUrray Hill 7-8875.*

November 17-20. Packaging Machinery Manufacturers Institute Show, New York Coliseum, New York. Contact: Hanson & Shea, Inc., One Gateway Center, Pittsburgh 22, Pa. *Telephone: ATlantic 1-8552.*

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PACKAGE engineering

AN ANGUS J. RAY PUBLICATION

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Our December, 1959 issue will carry a cumulative editorial index for the year listing our feature articles by subject, author, and other headings.

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A note from the Publisher

Visiting vendors' plants

Much is being written about the necessity of setting up packaging specifications, not only to assure uniform packages but to determine what the buyer is getting for his money as well. The importance of cooperation between package user and package supplier is stressed, but often this is interpreted to mean the supplier should know all about the users' problems and the package user need only sit back, and, if the supplier knows his business, he will automatically get good packages.

While the supplier certainly must be intimately familiar with his customers' problems, it is equally imperative for the package user to be familiar with the suppliers' problems—and this can best be accomplished by spending some time in the plants of suppliers. In this way he will know first hand how his packages are made, and just what is involved in filling his orders. He will also become familiar with devices and manufacturing practices that may enable him to get more value for his dollar. For instance, one chemical company can offer a little better price on various molding powders when orders are placed at a certain time during the month so that they can combine orders. Or, in the purchase of folding cartons, it is sometimes possible for the supplier to group orders and thus effect the economies of longer runs.

Some companies are geared for long runs only—and some specialize in shorter and more complicated runs and packages. Sometimes a particular type of package by its very nature may be prohibitively expensive in small quantities, but quite economical if used in volume.

One of the best known and ablest carton-purchasing men in the country formerly operated a carton plant. He told one of our editors that he spends more time in the plants of his carton suppliers than he does in his own office. He knows the problems of his suppliers, and he doesn't expect or ask for the impossible. On the other hand, because of his familiarity with his suppliers' problems, he occasionally can help them with manufacturing suggestions.

Another important advantage is the ability to better evaluate price. No reputable supplier will charge an exhorbitant price; thus, when a salesman who doesn't have your business says he can duplicate one of your packages for less money than you are paying, you will be better able to determine whether he is giving you a less effective package for less money, or whether his company actually has more efficient manufacturing methods.

By spending time in your supplier's plants and recognizing their problems, you will see just what is involved in complying with exacting specifications. You might also see the possibility of relaxing on certain areas of your specifications that are not of major importance, thus saving your company money without impairing the performance characteristics of your package.

Any man who writes exacting specifications should know two things: why he needs such accuracy (and be sure he needs it), and the problems these specifications will impose on the supplier.

Angus J. Ray

Publisher

PACKAGE engineering®

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Letters to PACKAGE engineering

Re: Potatoes in corrugated boxes

Gentlemen:

After reading Dr. Bird's fine article on the packaging and shipment of potatoes in the April, 1959 issue of PACKAGE ENGINEERING, I find there are some questions which I wonder if he would answer.

First, he mentioned that these boxes were 200-lb.-test board. Does he know if these boxes had a waterproof adhesive and/or a water resistant type medium to improve their strength?

Secondly, would he say that the high moisture content of the potatoes would in any way affect the corrugated box, thus making it necessary to use a special material other than standard 200-lb.-test material?

H. J. Schlotter
Director of Product Development
Hoerner Boxes, Inc.
Keokuk, Iowa

Dear Mr. Schlotter:

In answer to your questions: (1) Yes, all the boxes tested had waterproof adhesive. As far as I know, they did not have a water-resistant medium. I suggest you check with the box supplier, Boise-Cascade of Boise, Idaho.

(2) No, I think the standard 200-lb.-test material with waterproof adhesive does a satisfactory job. The reason the moisture is present is because the potatoes are washed about 30 seconds before they are put into the containers. I would estimate there is about ½ lb. of water in a 50-lb. box of potatoes at time of packing.

Kermit Bird, Associate Professor
Dept. of Agricultural Economics
Oklahoma State University
Stillwater, Oklahoma

Thank you, gentlemen. Questions and answers like these are helpful to all.

A Drop Test for Candy Packaging . . . typical of hundreds of rigid tests conducted at Du Pont's Film Department Technical Laboratories to evaluate the durability of cellophanes.

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Tests like the one shown above assure that you get the cellophane tailored to meet *your* needs . . . when you specify Du Pont cellophane by code designation.

When you need help, call your Du Pont Technical Representative. He is your best source of service. His reference folder, "Properties and Uses of Cellophane", can be useful to you. Ask him for a copy or write direct to E. I. du Pont de Nemours & Co. (Inc.), Film Dept. PE-8, Nemours Bldg., Wilmington 98, Del.

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DU PONT cellophane

The PULSE / of packaging

Trends to watch:

Metal can shipments showed a 21.4 per cent increase in April (according to figures just released), compared to the same month of 1958. Biggest boost: 124.6 per cent in cans for soft drinks, according to **Can Manufacturers Institute** . . . Collapsible metal tube shipments rose 15 per cent for the first quarter of 1959, according to **Collapsible Tube Manufacturers Council.** It says that the industry is recovering from the first impact of other forms of fluid and paste containers . . . During the next five years, the use of aluminum foil combined with paper, films and board will show a 50 per cent increase, and aluminum foil for this purpose will increase in consumption from its current annual rate of 100 million to 150 million lb. during this period, predicts **Laminated Foil Manufacturer's Association.** Consumer acceptance of foil in "convenience" food packages is a major influence underlying this trend, it says . . . **American Can Co.** thinks production of paper milk containers will run 15 billion units in 1959, nearly a billion container increase over the estimated 14.03 billion paper milk cartons produced in 1958 . . . We hear that at least one producer of soft drinks is now bottling them with a self-contained drinking straw made of extruded plastic. When a consumer removes the bottle crown, the straw (inserted at time of filling) recovers its original shape and pops up three or four in.

Packaging across the seas:

We hear that **Montecatini,** Soc. Gen. of Milan, Italy, has developed polybutene, a new plastic in the isotactic series of chemicals—which includes polyethylene and polypropylene. Montecatini says its new material (made from butene gas) shows promise, both as a molding material and for wraps and coatings . . . European observers from eight nations recently visited Michigan State University's school of packaging and various packaging operations in Michigan while on a six-week tour of the United States. Sponsored by the U. S. Department of Commerce and the European Productivity Agency, purpose of trip was to further their training as packaging consultants in their home countries . . . More companies step up their interest in international operations: **Crown Zellerbach** is establishing a new subsidiary to operate internationally—Crown Zellerbach Corp. International. Its purpose is to give greater scope to the company's activities abroad and to protect and strengthen its existing markets in foreign countries . . . **Pfaudler Permutit Inc.** now has an international division to direct its foreign operations with the same control procedures applied to its domestic plants. It has manufacturing subsidiaries or affiliates in Germany, Great Britain, Japan, Mexico and Australia, and recently purchased one in Canada . . . **Pacific Chemical and Fertilizer Co.** and **The Dow Chemical Co.** have organized **Hawaiian Extruders, Inc.** to manufacture polyethylene film and film products in Honolulu . . . **National Starch and Chemical Corp.** has purchased **Polimeros S.A.,** a manufacturer of vinyl acetate polymers in Mexico City. It already has polimerization plants in England and Canada . . . **Crown Cork and Seal Co.** reports more foreign interest in its high-speed equipment. It has made shipment to Peru, Puerto Rico, Bolivia, Mexico, Iraq, Iran, Cuba, Saudi Arabia, and Persian Gulf.

Groups in the news:

Society of Packaging and Handling Engineers has decided not to merge with any other group, is forging ahead on its own. Pending selection of a managing director, efficient, personable Kay Crowley "holds down the fort" as administrative secretary . . . **Packaging Institute** is moving into new areas. It recently formed an aerosol committee, expects this group will develop definitions and nomenclature of package components, establish standards for these parts, come up with test procedures and work with other groups concerned with aerosols. PI also is developing a resins committee to establish basic criteria on resin materials. Although user-oriented, this committee will work with packagers, converters, raw materials suppliers and machinery manufacturers . . . **Packaging Machinery Manufacturers Institute** will charge each visitor a $2 registration fee at its forthcoming November show. PMMI expects this will screen curiosity seekers, help interested packagers see exhibits more easily and get desired information more quickly . . . After six-month's study by a specially appointed committee, **Packaging Institute** decided against **American Management Association's** merger proposal. The following statement was issued by PI: ". . . we elect to move resolutely forward on our presently chosen course without alteration of the corporate structure of Packaging Institute, and we earnestly and gratefully seek mutually beneficial means for cooperation with the American Management Association short of intracorporate relationship."

More expansion for packaging:

General Foods Corp. plans a 140,000-sq.-ft. plant for manufacturing printed folding cartons in Saratoga Springs, N. Y. Proposed completion date: Summer, 1960 . . . After merging with **Fort Wayne Corrugated Paper Co., Continental Can Co.** has sold three of Fort Wayne's four corrugated box plants and liquidated the company. The three plants (Hartford City, Ind., Rochester, N. Y., and Pittsburgh, Pa.) were bought by **St. Joe Paper Co.** of Jacksonville which will continue their operation.

To expand its quality control and research activities, **American Maize-Products Co.** will construct a laboratory at Hammond, Ind. . . . A new firm, **Steven Enterprises,** Burlingame, Calif., announces its entry into the field of technical development and marketing of machinery and products related to packaging and plastics . . . **Cryovac Div., W. R. Grace & Co.,** expects to complete its $2 million addition to its Simpsonville, S. C. plant by 1961.

Two new corrugated box plants, in Torrance, Calif. and Phoenix, Ariz., will make a total of 17 such plants for **West Virginia Pulp and Paper Co.** St. Lawrence Corp., Ltd., Montreal, has purchased a majority stock interest (189,-864 shares—52.74 per cent of the common stocks) in **Hinde and Dauch Paper Co. of Canada, Ltd.** division of West Virginia Pulp and Paper Co.

A $0.5 million project to increase space for flexible packaging manufacturing by 50 per cent, has been announced by **Kehr Products Co.** . . . The **Lord Baltimore Press'** new 150,000-sq.-ft. plant for manufacturing folding paper cartons is now in operation. Special addition: A six-color lithography press . . . **Plastic Materials & Polymers, Inc.** announces plans for a plant at Slaters-

Circle No. 208 on Card, Page 71

Sure-Fire Packaging That Keeps Your Powder Dry

If you're aiming for sales in the booming market for hygroscopics . . . arm your products with the sure-fire ammunition of Western-Waxide packaging.

Whether you pack apple sauce or cocoa . . . Instant potatoes or milk, Western-Waxide has facilities and experience to develop and produce packaging that will keep your powders dry.

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For case histories and the facts on how others have saved packaging costs and increased sales of hygroscopics, write to Hygroscopic Packaging, 2101 Williams St., San Leandro, Calif. In the East, 4410 Hunt Ave., St. Louis, Mo.

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The RT brings new flexibility to packaging. Height, width and length changes are made quickly and easily without the use of change parts. Any heat sealing material can be used, including unsupported polyethylene. For complete details, write Hayssen today.

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Impulse sealing for polyethylene and other plastic films; resistance types for coated or laminated material.

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ville, R. I. The 26,500-sq.-ft. plant is for the production and development of thermoplastic materials.

St. Regis Paper Co. plans a $2 million modernization program at its Deferiet, N. Y. paper mill, which includes a two-stage bleach plant to produce 150 tons of bleached groundwood pulp daily . . . **The Dow Chemical Co.** has purchased a 208,000-sq.-ft. industrial plant in Findlay, Ohio for conversion to polyethylene film manufacture.

Marathon Southern Corp., an **American Can subsidiary**, has formally opened its new 500,000-sq.-ft. paper mill in Naheola, Ala. . . . New 25,000-sq.-ft. quarters have been taken over by **Comco Plastics, Inc.** . . . **Western Corrugated, Inc.** announces the completion of its 100,000-sq.-ft. plant in Compton, Calif.

AviSun Corp., joint affiliate of American Viscose Corp. and Sun Oil Co., is building a 10 million-lb./yr. polypropylene film plant near New Castle, Del. . . . A paper machine will be installed at **Waldorf Paper Products Co.** and **Hoerner Boxes, Inc.**'s pulp mill at Missoula, Mont.

American Can Co.'s 150,000-sq.-ft. plant in Atlanta (to be completed November 1), will produce about 400 million metal cans annually . . . After realigning its research and development division, **American Viscose Corp.** has created a polyolefin department to facilitate work on stereo regular polymers, films and fibers.

What people are doing:

Expansion of The Dobeckmun Co.'s research, product development and technical service division (headquarters, Cleveland) has resulted in these appointments: **George Lacy**, director of research and preliminary development; **Ross C. Reed**, manager of product development; **Drew Burton**, manager of converted products; **Fred C. Dulmage** (for nine years head of The Dow Chemical Co.'s plastic technical service department), manager of free films; **F. Jack Gibbs** and **Robert J. McCormick** (former Dow plastic technical service engineer) join Dulmage in forming the film technical service group.

At Dobeckmun's new polyethylene plant in Findlay, Ohio, **Austin E. Dawson** has been named plant superintendent; **Vincent P. Hess**, controller; **John Moss**, technical director, and **Paul J. Fournier**, purchasing agent. Also, Dobeckmun has named **Wayne M. Husband** sales representative for Florida, and **Russell K. Canfield**, assistant district sales manager in New York. . . . The Dow Chemical Co. has named **Walter P. Creamer** head of plastics sales, Boston, replacing **Richard W. Beckwith**, who moves to the Washington office.

Reorganization of Crossett Paper Mills'

Waldorf KNOWS *Packaging*

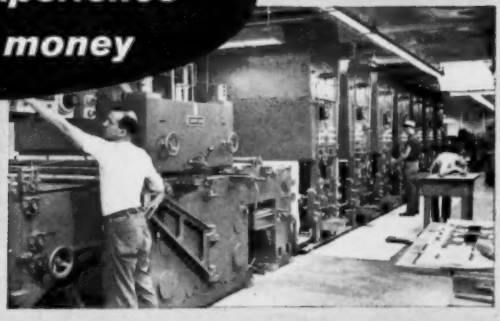
from forest to finished products

1 With Waldorf, better packaging starts in the forests of Montana and Northern Minnesota. Waldorf cartons and containers are made from pulp that comes from trees that thrive in the snow.

2 Peeled logs arrive at the Waldorf plant to begin their conversion into cartons and containers. Over 35 carloads of pulp and pulp wood a day are used.

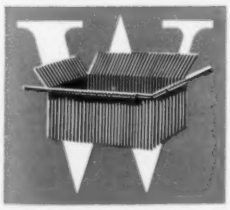
Waldorf packaging experience saves you money

3 Four paperboard machines, two Fourdrinier and two cylinder, are producing hundreds of tons of container and carton board daily.



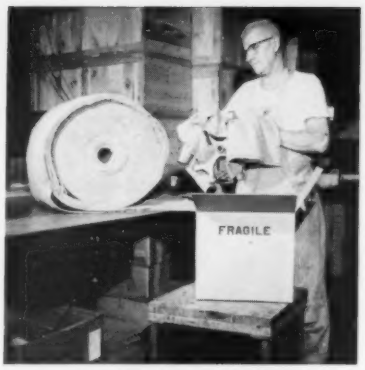
4 In the converting plant, skilled men and machines make packages that protect, ship, store, display and sell America's products.

Waldorf is one of the nation's largest single-plant operations manufacturing packaging.



Waldorf helps plan and makes packages of all kinds for many of America's best known brands. When you work with Waldorf, no other packaging service is required. Let us prove to you how we can save you time and money. Call or write us.

WALDORF **PAPER PRODUCTS COMPANY** ST. PAUL 14, MINN.



A cleaner, faster operation resulted as International Equipment Co., Boston, switched from excelsior (left) to Cel-Fibe wadding (right) to wrap motors, parts, test tubes, and dynamically balanced instruments in its line of precision centrifuges for laboratory uses.

CEL-FIBE® protective packaging doubles output, increases safety

"Cel-Fibe cellulose wadding is the best packaging material we have ever used," says C. Clifford Hodge, production coordinator for International Equipment, leading supplier of laboratory centrifuges, citing these improvements:

Savings in time, labor. An operator packs double the amount—Cel-Fibe wrapping takes only half as long.

Savings in materials. With Cel-Fibe, one carton holds as much as was formerly packed in two cartons or a wooden case. Cel-Fibe ends the need for separators to partition tubes, fragile parts, and glassware.

Savings on storage. Wadding, paper, and other packaging materials are kept with space to spare in a room that had previously been set aside for storing a ton of excelsior.

Savings in shipping weight. Cel-Fibe permits use of fewer, lighter cartons.

Savings in maintenance. Apart from easier handling, non-shredding and non-powdering Cel-Fibe leaves no dust in the air or dirt on the floor, reduces clean-up time . . . also makes it easier, faster, and less messy for customers to unwrap orders.

Savings on returns. Low-sulfur and neutral-pH Cel-Fibe guards metals from corroding and surfaces from marring, avoids return of centrifuges bent or unbalanced in transit.

Your packaging problems can probably be lessened by learning how "success is certain with Cel-Fibe" in meeting military specifications and civilian requirements for cushioning and surface protection. Cel-Fibe is always available, when and as you need it. For more information—*write, wire, or phone:*

CEL-FIBE

Division of Personal Products Corp.

Milltown, N. J. • MIltown 8-0700

ONE OF THE Johnson-Johnson COMPANIES

sales and production departments has created a production department. The three subsequent positions will be filled by **A. B. Moore, Jr.**, division production manager, **C. L. Brown** and **Robert E. Collins**, mill managers. . . . Crown Cork & Seal Co., Inc. has elected **Samuel Cooke** a director, and **William D. Wallace** and **Lowell H. Smith** vice presidents. Crown Cork's new manager of packers, beer, beverage can sales is **Morton M. Dukehart.**

Fred S. Breeland has joined Clupak, Inc. as field engineer . . . New technical director of Fome-Cor Corp. is **Frank S. Bonham** . . . Bemis Bro. Bag Co. has elected **C. C. Hammer** treasurer, replacing **T. W. Little**, who continues as a director following his retirement . . . AviSun Corp. (American Viscose Corp. and Sun Oil Co. affiliate) has named as product managers **Dr. Edward T. Severs** films, and **Edwin M. Irish, Jr.**, polymers.

Scott Paper Co. announces the appointment of **H. L. Swan** as manager of packaging procurement division . . . Three sales management positions recently created at U. S. Industrial Chemicals Co. have been filled by **Warren E. Johnson**, chemical sales; **Vincent D. McCarthy**, plastics sales, and **George H. Stanton**, field sales . . . **Hugh W. Hicks** has been appointed vice president and general manager of The Lord Baltimore Press of California . . . Visking Co.'s new manager of industrial relations is **William L. Ketner.**

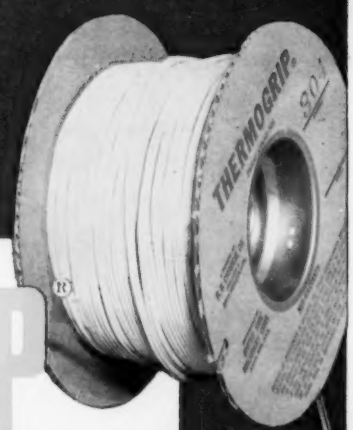
Chase Bag Co. has named **Eugene P. Alexander** sales manager of its paper bag division. **William J. Gosney** succeeds Mr. Alexander as manager of the Chicago sales office. Also at Chase, **Thomas A. Eadon, Jr.** is now sales manager of the New York sales department, and **E. M. (Woody) Woodrich** replaces Mr. Eadon as Philadelphia sales manager.

Thomas A. Jones has been promoted to president, molded-packaging division, Diamond Gardner Corp. . . . Derby Sealers, Inc. has named **James J. Lowe** assistant sales manager . . . **Auburn J. Perry** has been transferred to the Northeast sales department of Oxford Paper Co. as sales representative.

Continental Can Co. has named two new general managers for its fibre drum and corrugated box division: **C. U. Harvey**, Eastern district, and **G. W. Olson**, Northeastern district. Sales manager of its multiple packaging at the boxboard and folding carton division is **William M. Brown**, and assistant products sales manager for nonfood cans at its metal division is **Hazen P. Master.** At the Hazel-Atlas Glass Div. **Robert W. Watson** has been appointed manager of quality control, and **Eugene W. Fichter** manager of West Coast manufacturing operations.

(*Turn page*)

NOW APPLY THERMOGRIP HOT MELT ADHESIVE



UP TO 3" WIDE

New application techniques — new output fittings are bringing more firms the advantages of fast setting "hot melts". Now you can apply adhesives at higher speeds without slipping or squeeze-out and they're clean and easy to use. Adhesive bands from 1/16 of an inch to three inches wide can be applied to continuous moving webs.

Moisture-proof tape-over-stitching can be done better, faster and economically. Wide seams can be used where greater strength is needed. Wherever tapes or strip materials are combined in continuous operation THERMOGRIP cord-like adhesives and new applying devices may help you do a tough bonding or production job.

THERMOGRIP adhesives bond paper and paperboards faster, have proved also to be the answer for polyethylene and plastic coatings, foils and many types of hard-to-bond materials used by packagers and converters. Send for information today.

Get this new catalog illustrating all THERMOGRIP applicators with application data and specifications on both applicators and adhesives.

United

UNITED SHOE MACHINERY CORPORATION
140 Federal Street, Boston 7, Mass.
Please send me your new catalog on THERMOGRIP adhesives and applicators.

NAME.....TITLE.....

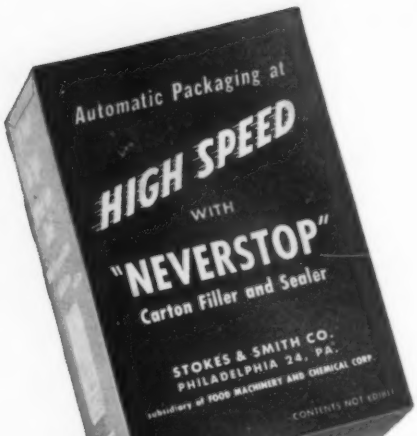
COMPANY.....

ADDRESS.....

CITY.....STATE.....

A significant advance in automatic high-speed carton filling and sealing

Only S & S Neverstop ca

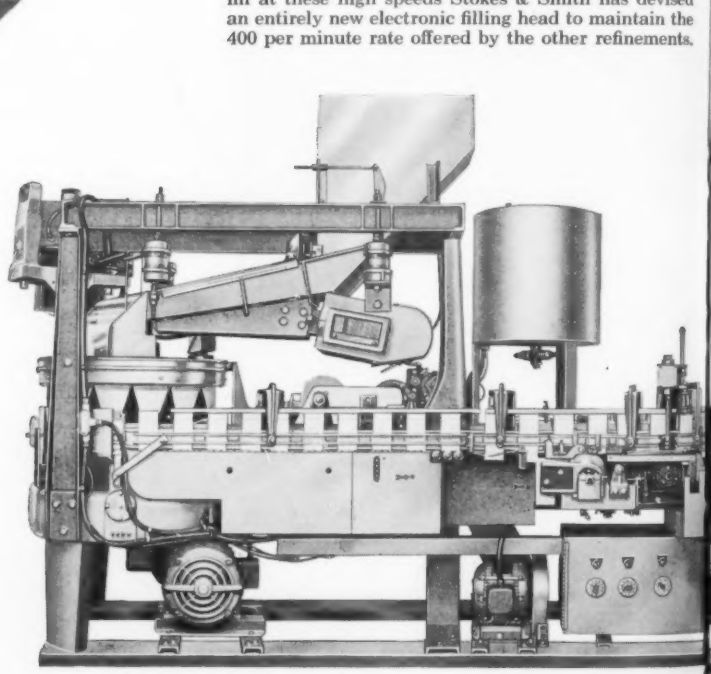


Typical preprinted folding cartons automatically filled and sealed, with hot-melt adhesive, on Neverstop Model EH operating at a speed of 400 cartons per minute.

1 High speed carton filling and sealing... up to 400 per minute

Stokes & Smith has perfected and incorporated as standard features a series of important refinements which make possible higher filling and sealing speeds than ever before. First of these refinements is a new method of carton feeding utilizing suction to open and accurately position the cartons in the feed conveyor. Depending on the carton size, this new feed can operate at a rate up to 400 cartons per minute.

Selective, continuously running glue rolls, accurately spot adhesive on the carton flaps to assure positive bonding at high speed. To accurately control net fill at these high speeds Stokes & Smith has devised an entirely new electronic filling head to maintain the 400 per minute rate offered by the other refinements.



For complete details of these new developments, write for your copy of Neverstop Bulletin P-808.

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION
FMC Packaging Machinery Division
Stokes & Smith Plant
4994 SUMMERDALE AVENUE, PHILADELPHIA 24, PA.

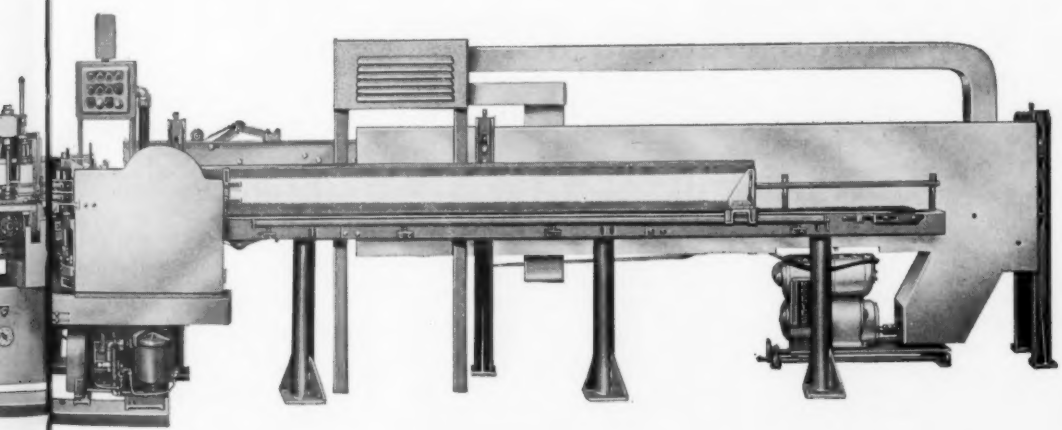
...can give you...

2 Electronically controlled filling accuracy

This radically different filling method is designed for high speed filling which is accurate even when product density varies. The new head controls by electronic feed-back the rate of product flow into cartons to assure uniform net weight fill. It consists of a vibrating chute from which the product is continuously discharged on to a slanted check-weight scale pan and then into the cartons. The rate of flow is pre-set to deliver required net fill at the desired speed. Any deviation from this pre-set rate of flow is detected by the scale and relayed to the electronic monitor which automatically corrects the rate of flow by adjusting the amplitude of vibration in the chute.

3 With either hot melt or cold glue

For the first time, two basically different types of sealing are offered to assure positive bonding of a wide variety of carton stocks. In addition to cold glue, Stokes & Smith now offers models equipped for hot melt (thermoplastic) adhesive sealing . . . perfected and field tested for Neverstop in cooperation with adhesive producers and carton suppliers. With suitable cartons, hot melt opens up excellent possibilities for producing carton seals made sift-tight and "moisture-proof" without liners or overwraps. Substantial savings can thus be realized in the packaging of cereals, soap powders, spices, dessert powders and many other free flowing products where such sealing properties are desired.



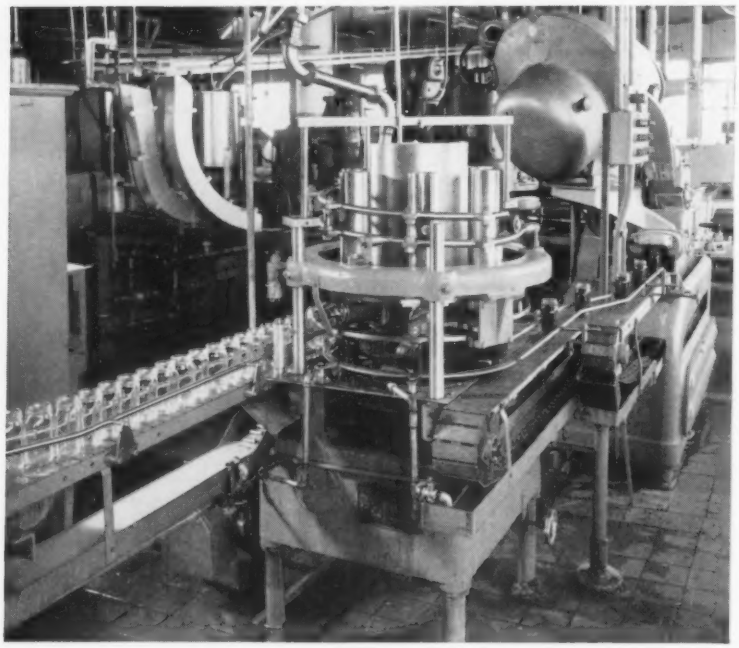
6 models

To meet your packaging requirements at lowest cost, Neverstop is available in six models with a wide range of options as to carton size, speed of fill, filling method and type of adhesive.

For more information circle No. 213 on Reader Service Card, Page 72

FLUIDICS

is a new PFAUDLER PERMUTIT program that provides a modern, imaginative approach for handling and processing more profitably the liquids and gases involved in: blending, evaporation, distillation, drying, filling, heat transfer, storing, centrifuging, agitation, water and waste treatment, corrosioneering, and metering.



FLUIDICS AT WORK

How to fill even viscous hot fudge with speed and accuracy

If you have problems filling viscous products accurately without losing speed, consider the experience of the Robert A. Johnson Company with their six-station Pfaudler rotary piston filler.

Mr. A. O. Meyer, Plant Manager, says, "The Pfaudler filler has been giving us some very good results. We fill approximately 55 six- or eight-ounce jars per minute with heavy hot fudge without a spill. And we also package caramel, butterscotch and chocolate syrup.

"The filler takes only about a half hour to clean thoroughly. We've had very little maintenance with it. In fact, all it really needs is a routine cleaning and lubrication."

The RP-6 filler is the smallest in the Pfaudler line . . . an ideal model for filling small lots of a number of products. Change-over for various container heights takes only about 12 minutes. Other models of the rotary piston filler will handle up to 1050 cans a minute. All these fillers are rated to ± 0.1 fluid ounce accuracy.

If you'd like the full story on the complete line, write to our Pfaudler Division, Dept. PE-89, Rochester 3, N. Y.

PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS . . . the science of fluid processes

Mead Containers, Inc. has named **Kenneth G. Foeppel** district sales manager of western New York, and **Joseph Donnelly** of its Miami division . . . **William Sibbach** has joined Rap-In-Wax Paper Co. as development chemist . . . The Karl Kiefer Machine Co. has appointed **Philip V. V. Hurlbut** sales executive, and **David Shields** sales representative for New England.

Erik Ungern has joined the Cel-Fibe Div. of Personal Products Corp. as assistant production manager, and **Thomas J. Santo-Salvo** is Cel-Fibe's new special representative . . . **Adolph E. Maves** is now Columbia Box Board Mills, Inc.'s director of industrial and public relations, and **Henry M. Greenhouse** is now technical director.

At Olin Mathieson Chemical Corp., **Kenneth E. Booth** has been named assistant product manager for carton operations, packaging division, and **Henry H. Hunter**, director of communications . . . A realignment at Crown Zellerbach Corp. produced these changes: **A. B. Layton**, chairman of the new finance committee; **Reed O. Hunt**, president and chief executive officer; **D. J. Benjamin**, vice president for packaging operations. **F. O. Boylon** is now assistant vice president for manufacturing, San Francisco, and **Robert B. Roberts**, Northern regional sales representative — also at Crown Zellerbach.

W. F. and John Barnes Co. has created a food and container division, and named **W. M. Parry** sales manager, and **R. H. Rummel** chief engineer . . . New appointments at Consolidated Paper Co. are: **Robert D. Morse**, manager of manufacturing; **William Lunsford**, technical manager; **F. B. Grunwald**, plant manager, South Side Div.; **George Baron**, plant manager of North Side Div.

New assistant managers in the packaging sales division of Du Pont's film department are: **John W. Truitt**, Southwest; **Robert A. Dunn**, Northeast; **John P. Breen**, New York, **William L. McIntosh**, central, Chicago; **Donald K. Vanneman**, central, industrial film sales . . . **A. E. (Gene) Stephens** will cover Colorado and southern Wyoming as district manager for Richardson Scale Co.

Albert E. Osman has joined Thomasson of Pa., Inc. as production manager . . . New director of research for Westfield River Paper Co., Inc. is **Allan T. Walsh** . . . Stone Container Corp. has named **Robert M. Briggs** general manager of its Chicago corrugated container plant . . . Fibreboard Paper Products Corp.'s central packaging division has created an Omaha sales district which will be managed by **Everett H. Baker**. Also at Fibreboard, **Howard R. West** has been named advertising and sales promotion manager.

President of the recently formed Western Petrochemical Corp. is **Maurycy**

WHY PUT A ROUND PRODUCT IN A SQUARE PACKAGE?

Let Keyes Product Development Engineers Show You How Molded Contour Packaging Can Cut Costs, Breakage

Molded pulp is the one inexpensive packaging material that combines rigidity with remarkable cushioning properties. Contour packaging eliminates fillers and dividers, cuts packing costs to a minimum. Molded pulp contour packaging facilitates automation... reduces cubage, saving valuable warehouse and shipping space.

Keyes molded pulp contour packaging has solved shipping and breakage problems for dozens of hard-to-package products including eggs, glassware, fruit, lamps and electrical parts. This experience, together with complete, modern production facilities means that Keyes can develop and produce for you custom designed packaging that cuts costs, reduces breakage.

For free consultation on your packaging problems write:
Product Development Division, Dept. PE-8
Keyes Fibre Company
Waterville, Maine

KEYES
MOLDED PRODUCTS

WANT TO FILL
—ANYTHING?

COLTON

Small, Accurate Fills

CONTAINERS: vials, bottles, jars, cans.

PRODUCTION: up to 480 fills per minute.

TUBE FILLING: metal or plastic.

COLTON-HOPE

Filling Alcohol to Caulking Compound

VOLUME: ¼ oz. to 1 gallon.

PRODUCTION: models for speeds up to 300 per minute.

PRODUCTS: foods, dairy products, drugs, paints, cosmetics, industrials.

CONTAINERS: bottles, cans, tubes, jars, paper cups, pails.

COLTON-ALPHA

Aerosol

ROTARY AND STRAIGHT LINE: gassers, pressure fillers, shakers, crimpers, testers.

LABORATORY EQUIPMENT: hand operated.

VOLUME: up to 500 cc.

CONTAINERS: cans, bottles and vials.

Send for the new Colton chart of filling machine applications. It shows machine types, capacities, speeds, product types, etc., of the world's most complete line of filling equipment.

ARTHUR COLTON CO.
3451 E. Lafayette
DETROIT 7, MICHIGAN

Bloch . . . Additions to West Virginia Pulp and Paper Co.'s sales staffs are: Midwest, **Warren A. Finberg**, representative for the multiwall bag division; South, **Jason M. Elsas**, regional manager, and **Lawrence M. Donovan**, representative, Georgia area; West Coast, multiwall bag sales, **Eugene Revelle**, consultant, and **William M. Ritchie**, technical service representative. East, **Kenneth F. Rupp** has been named assistant to the New York regional sales manager of the multiwall bag division. **Clinton W. Smullen, Jr.** replaces Mr. Rupp as Philadelphia sales representative.

Reynolds Metals Co. has appointed **Walter M. Shields, Jr.** assistant manager of canned and frozen foods market . . . **Lucille Lightfoot** is now head of product quality control for Packaging Corp. of America . . . Economic Machinery Co.'s new sales office in Cincinnati will be headed by **Arthur R. Johnsen. Frank Loonam**, Pacific Northwest, and **D. Russell Phillips**, Midwest, are now sales engineers for Economic.

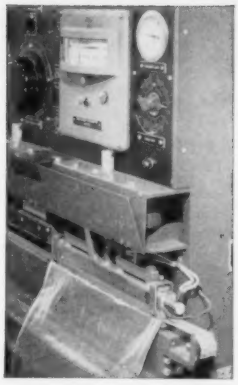
New appointments at Container Corp. of America are: **Leroy A. Paris**, service manager, Dallas-Fort Worth folding carton plant; **Thomas W. Andrews, Jr.**, mill manager, Philadelphia paperboard mill; **Donald Hanlon**, general manager, Sefton Fibre Can Co.'s St. Louis plant; and **Dennis R. Reilly**, purchasing agent, foreign division purchasing department.

Mojonnier Associates Kartridg-Pak Machine Co. has named **John Meek** western sales and service representative—and **Ernest E. Koken** engineering manager, replacing **Albert B. Mojonnier**, who will work on development of machinery and products in the company's new research facilities . . . Mosinee Paper Mills Co.'s new position of manager of technical sales service will be held by **William J. White** . . . Sales manager of the box board division of Consolidated Paper Co. is **John P. Bronson.**

In its sales expansion program, the industrial sales division of United Shoe Machinery Corp. has appointed two new sales representatives for industrial adhesives—**John G. Howley** and **Charles F. Donovan.** Also at United Shoe, **John C. Eldridge** is now manager of sales development for Thermogrip hot melt adhesives and **William J. Blatchford** is in charge of installations and service.

At Owens-Illinois Glass Co., **George W. Cook** has been named director of purchases and traffic (a new position), and **Robert J. Mayne** general purchasing manager. **Stewart M. Lang** has joined Owens' fundamental research section. At Owens' glass container division, **Guy B. Clark** is now quality supervisor, succeeding **Henry G. Nelson** who has been named coordinator of quality control, paper products division. *(End)*

DELIVERING MOST OF THE BEST–



The heat seal test is one of the many film tests that assures high performance from packaging film made of Monsanto polyethylene resins. An instrumented heat-sealer controls pressure, time and temperature. The most dependable seals are made on film extruded from 706!

Polyethylene packaging film based on "tested-best" Monsanto Polyethylene 706 Resin

No question about it—polyethylene film delivers what industrial packaging must have—great tear-resistance, smooth finish, inertness to chemicals, moisture resistance, flexibility and toughness unaffected by low temperatures. And test after test proves that polyethylene film extruded from Monsanto 706 delivers best.

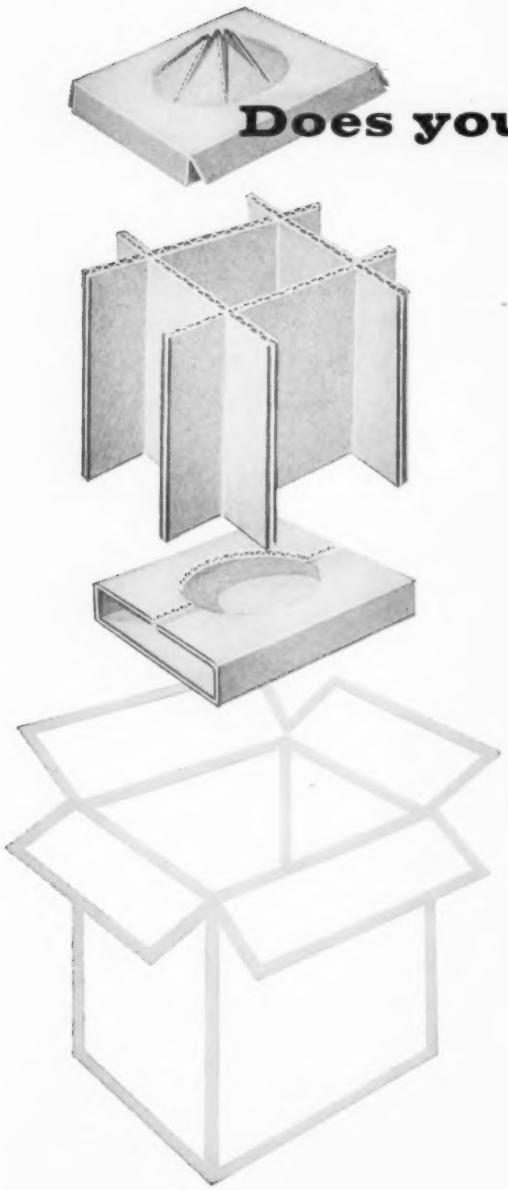
Specifically developed for industrial films, 706 resin produces films that heat-seal consistently and positively. These films provide great impact strength, excellent openability, and uniform translucent appearance.

For the most dependable packaging performance, order polyethylene bags and liners based on 706, the Monsanto resin that "tests best!" Write for names of converters and suppliers, to Monsanto Chemical Company, Plastics Division, Rm. 1003, Springfield 2, Massachusetts.

Monsanto

What you should know abou interi

Does your corrugated box



For most products, proper interior packing is one of the most important factors in corrugated container design. Through its careful selection you can often prevent a costly chain reaction of damage claims and rejected shipments.

How much and which types to use will depend primarily on your product, its construction, how it is normally handled and shipped as well as the type of protection needed. You may find, for example, that *anchoring* the contents is paramount. Some packing pieces are made expressly for this purpose. Others *cushion* against impact and vibration. Still others are used to *separate* packed units. A fourth groups primary job is to *suspend* the contents within the container.

The forms of interior packing are as versatile as the items they protect. A few of the most widely and successfully used types are described here:

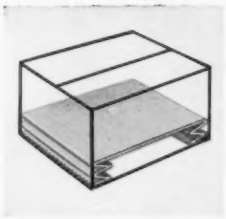
SPRING PADS

Like innersprings, these accordion-shaped pads help dissipate and cushion shock. Their buffer action absorbs vibration

For more information circle No. 218 on Reader Service Card, Page 72

about interior packing for Union Boxes.

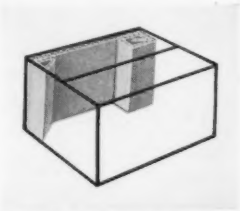
...oneed an "innerspring mattress"?



which can cause loosening of parts and actual breakage — particularly where it coincides with the natural frequency of the packaged product and sets up harmonic resonance.

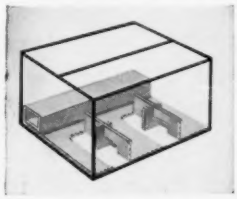
CORNER PIECES

These units "round off" the corners of the box's interior—provide extra protection at these vulnerable points. They cushion against crushing caused by improperstacking and impact resulting from humping or switching of freight cars, throwing, dropping and other shipping hazards that might squeeze or otherwise damage the contents.



DIE CUT SHEETS

Die cut inner packing comes in an almost limitless range of shapes, sizes, thicknesses. It can be made to perform practically any protective function. The pieces nearly always are tailored around the product—usually a fragile article, an item of irregular shape or one of unbalanced construction. Die cut inner packing is being used increasingly today because of the wide variety of items now shipped in corrugated containers.



Interior safeguards recommended or developed by Union-Camp are saving many companies thousands of dollars annually in packaging costs. Not to mention untold dollars that have been saved through the elimination of shipping damage. Whatever your product, your Union Box representative will be glad to work with you in determining the most efficient and economical approach to your particular packaging operation.

Write for free, informative booklet "Interior Packing of Corrugated Boxes"

union camp

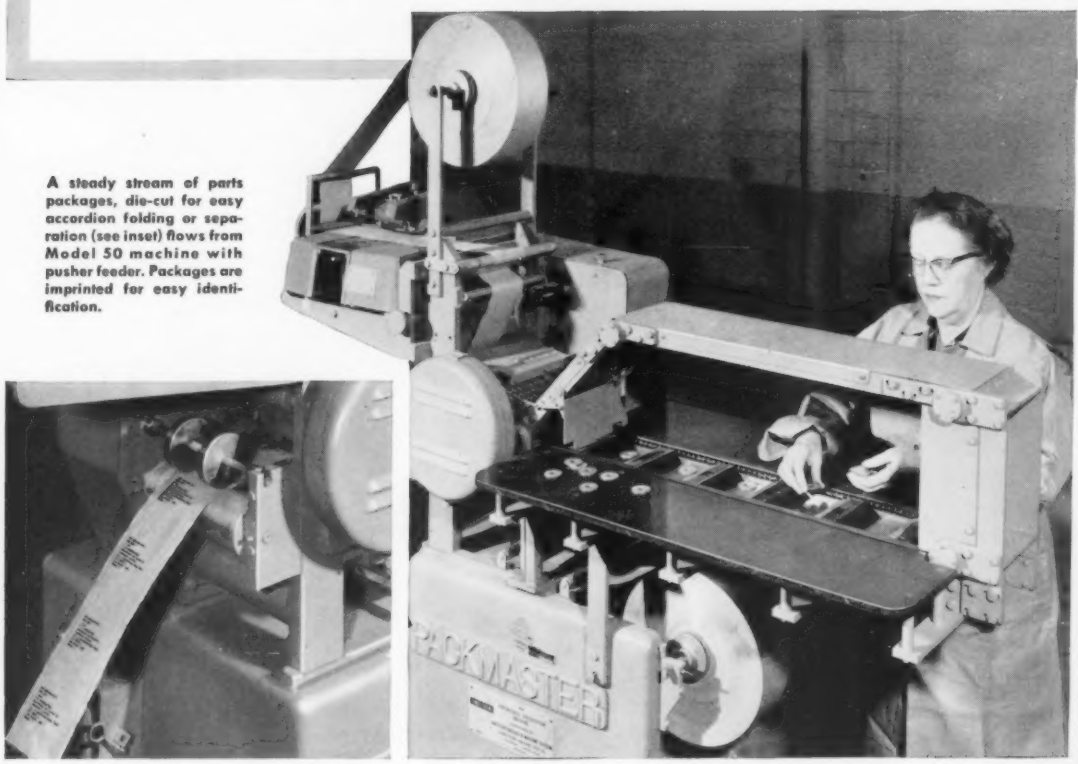
UNION BOXES

UNION BAG-CAMP PAPER Corporation
233 BROADWAY, NEW YORK 7, N. Y.

Factories: *Savannah, Ga.; Trenton, N.J.; Chicago, Ill.; Lakeland, Fla.*

Sales Offices: *Eastern Division—1400 E. State Street, Trenton, N.J.*
Southern Division—P.O. Box 570, Savannah, Ga.; P.O. Box 454, Lakeland, Fla.
Western Division—4545 W. Palmer, Chicago, Ill.

Pusher feeder Packmaster handles single or multiple parts packaging at same high speed



A steady stream of parts packages, die-cut for easy accordion folding or separation (see inset) flows from Model 50 machine with pusher feeder. Packages are imprinted for easy identification.

When the job calls for high rate packaging of single or multiple items, the Sundstrand-Packmaster Model 50 with pusher feeder offers exceptional opportunities to cut costs. Machines can be provided for any one package size from 2 x 3 inches to a maximum of 6 x 6 inches. Packaging rate varies from 40 per minute for the 6 x 6 inch size to 80 per minute for 3 x 3 inch package.

When production requirements are high and maintained for an extended period, one to four automatic hopper feeds can be added. This enables one operator to oversee several machines with duties consisting solely of keeping hoppers supplied and wrapping materials on the rolls. Number of parts per package is limited only by the physical dimensions of the parts and package itself.

Packages may be opaque on both sides, transparent on both sides, or transparent on one side and opaque on the other. A choice of two types of printers, as optional equipment at extra cost, permits each package to be identified to meet government or customer specifications. For installations requiring change in package size, a dial feed Model 50 machine is available offering unusual change-over flexibility.

Additional information on Sundstrand-Packmaster machines is available in Bulletin A-256. Write today for your copy.

SUNDSTRAND

SUNDSTRAND-PACKMASTER

Manufactured and Distributed by

SUNDSTRAND-AMERICAN BROACH, Ann Arbor, Michigan

Division of SUNDSTRAND CORPORATION

For more information circle No. 219 on Reader Service Card, Page 72

Circle No. 220 on Card, Page 72

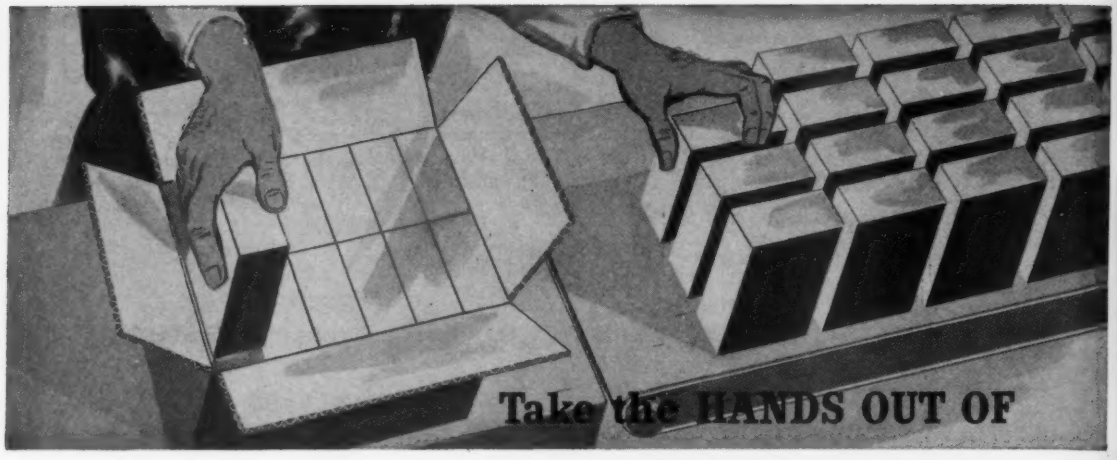
another Olin Mathieson packaging product!

CORRUGATED CONTAINERS

Fragile . . . package with Skid-Master

You get extra protection at no extra cost by ordering Skid-Master containers with built-in nonskid surfaces. Skid-Master nonskid kraft provides the working traction that controls container slippage and sliding in transit and in warehousing . . . a major cause of product damage. And, you get this extra protection without sacrificing package appearance or strength. Skid-Master containers print, seal, and handle like regular, untreated kraft. Contact Olin Mathieson today: Packaging Division, West Monroe, Louisiana.

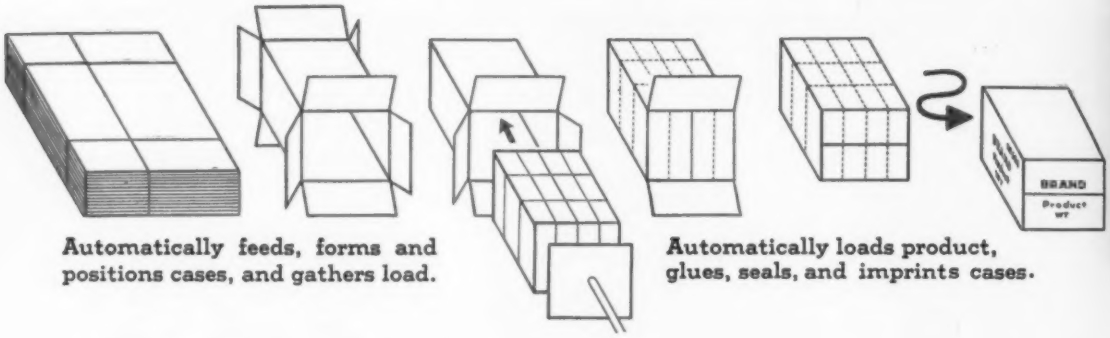
OLIN MATHIESON • PACKAGING DIVISION



Product Handling

let Packomatic® equipment do any or all your casing operations AUTOMATICALLY:

T.M. Reg. U. S. Pat. Off.



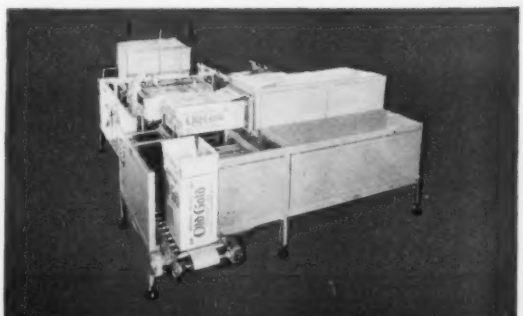
Automatically feeds, forms and positions cases, and gathers load.

Automatically loads product, glues, seals, and imprints cases.

For casing round, square, rectangular, or free-form packages of virtually any size.

If you employ even one person per shift to hand-form cases, or to hand-pack, hand-seal or hand-imprint them, then it can pay you to install Packomatic equipment. And if you employ two or more people the savings can increase proportionately. Even a **complete** automated Packomatic line requires only a minute or two of attention at infrequent intervals to match the output of a dozen pair of hands. And in addition to reducing your direct labor production costs Packomatic can, by utilizing end-opening shipping cases, reduce paper-board costs up to 25%. And mechanically end loaded cases are stronger too, because the flaps give added resistance to weight and shock. In addition, they stack better because their uniformly flat sides enables keying of pallet loads. Write, wire or phone us for facts on how to reduce your casing costs.

FOR EXAMPLE: This Packomatic machine at the P. Lorillard Co. automatically forms and positions cases, end-loads regular or king-size cartons of Old Gold cigarettes (60 cartons per case) and up-ends cases for sealing — at the rate of 400 cartons per minute, or nearly 5 million smokes per hour.



PACKOMATICS include Case Sealers • Case Opener-Loaders • Case Packer-Gluers • Case Imprinters • Bale Sealers • Automatic Equipment for Shelf Carton Making, Feeding, Filling and Closing • Round Paper Can Mfg. Equipment

J. L. FERGUSON COMPANY - Box 1226 Phone 6-6275 - Joliet 1, Illinois

How to change the course of your business with the right change in packaging

Naturally, that's what you'd like to do ... the question is HOW? The answer could be right in this label

BETTER PACKAGING
ALCOA WRAP
ALUMINUM COMPANY OF AMERICA

Exactly what does this label mean?

It means—Alcoa, with the greatest fund of aluminum knowledge in the world . . . Alcoa, with the only full-scale packaging laboratory in the country, where we can test ideas, check costs, answer all problems from design to package performance . . . Alcoa, teamed with their converter specialists to provide so much more than any single company can—top facilities, top service, top know-how, all along the line.

Does your packaging need improving? Whatever your plans or problems, we're all set to tackle them. Call your Alcoa salesman or write Aluminum Company of America, 1657-H Alcoa Building, Pittsburgh 19, Pa.

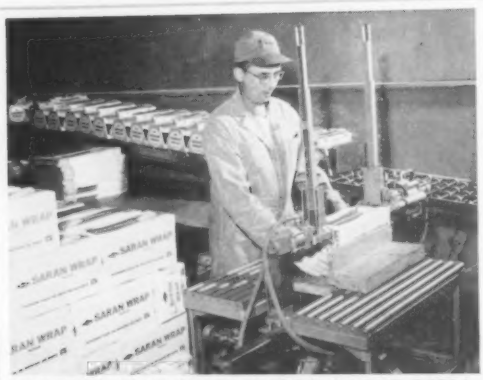
You're always ahead with Alcoa . . . greatest name in aluminum

REDUCES LABOR COSTS 50%! Four other methods were previously used to close filled cartons for this manufacturer's automotive and television accessories. Two people averaged 1100 cartons per 8-hour day. International Dual Stapler installation which simultaneously staples top and bottom flaps of filled cartons has upped production to 1500 (400 more cartons per day) — with just **one** operator.

REPLACES TWO OTHER METHODS—CUTS MATERIAL COSTS IN HALF! In a newly streamlined packaging program, this chain manufacturer has replaced glued-up corrugated cartons and wire-bound boxes with stapling, using an air-operated portable International "Air Boxer". Results: Substantial material savings and labor costs cut in half.

Case Histories Prove

INTERNATIONAL STAPLING METHOD CUTS CARTON CLOSING COSTS BY 50% *AND MORE!*



CLOSES BOTH ENDS OF CARTON IN ONE OPERATION—INCREASES PRODUCTION! This manufacturer turned to the versatility of the International Twin End Stapler for closing tops and bottoms of their center-slot shipping cartons. International Twin-End Staplers are primarily used to close both ends of partial overlap, full overlap or telescope cartons, but can also handle center slot cartons. Adaptable to a carton size range from 6" to 28".

NO OTHER METHOD OF CARTON CLOSING offers you such large savings in so many ways — in material, productivity, storage, safety, reusability and labor. These savings are possible because the International method of stapling is **fast** (up to 500 cartons per hour — according to your needs); **efficient** (cartons are filled before stapling); **neat and safe** (a better-looking carton that's pilferproof and reusable.)

ASK YOUR INTERNATIONAL REPRESENTATIVE for details on other dollar, time and labor-saving advantages . . . and for information on International units best suited to your operation.

Write for "The Modern Low Cost Way to Close Cartons."

INTERNATIONAL *Gold Crown*

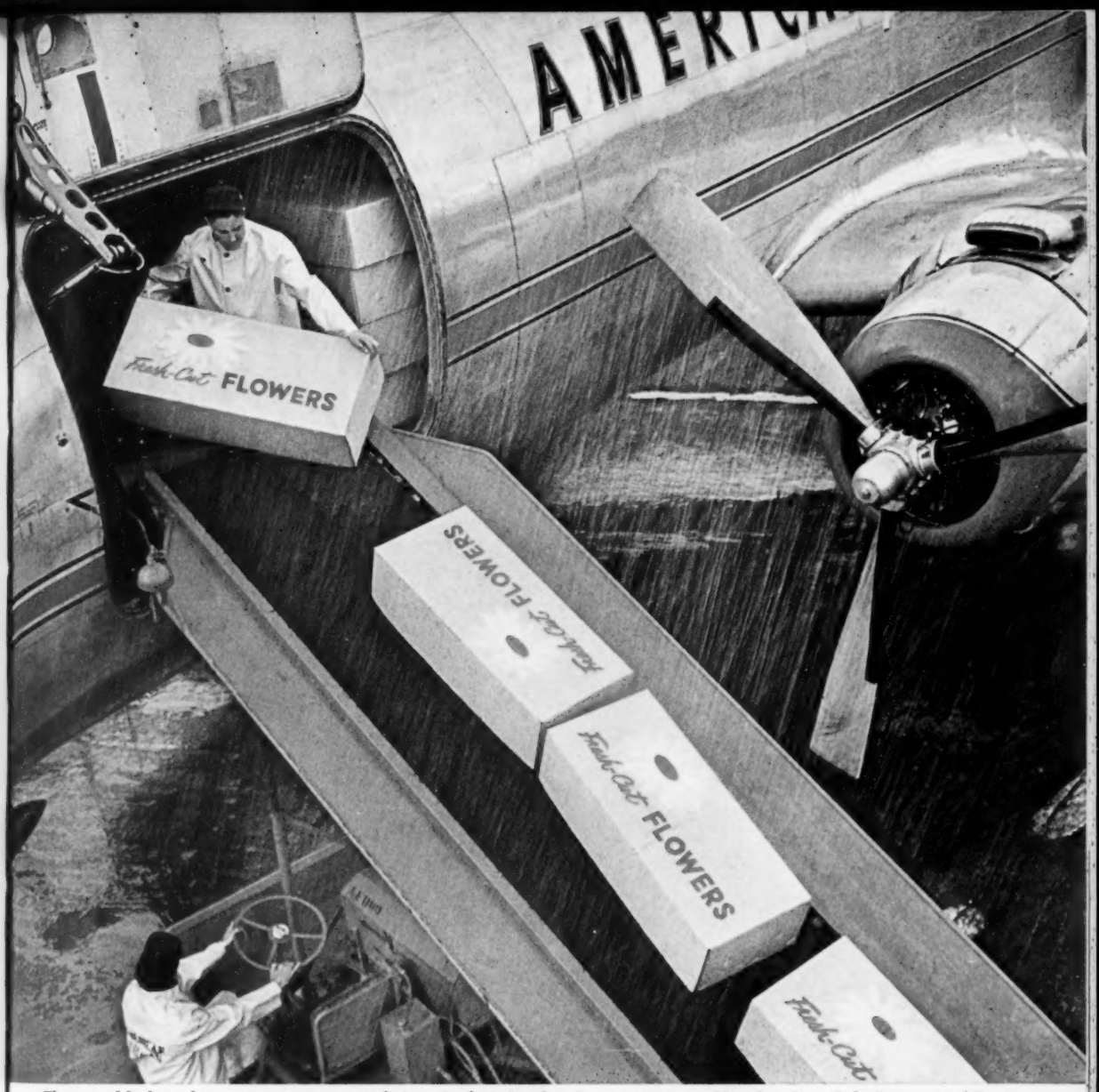
International Staplers

INTERNATIONAL STAPLE & MACHINE COMPANY
P. O. BOX 270 HERRIN, ILLINOIS

Originators of Carton Closing Staplers

For more information circle No. 223 on Reader Service Card, Page 72

Circle No. 224 on Card, Page 72



These good-looking shipping containers are made from Sunkraft linerboard—one of 24 special linerboards made by International Paper.

Amazing new Hydro-Chem by International Paper withstands rain, cold storage, manhandling

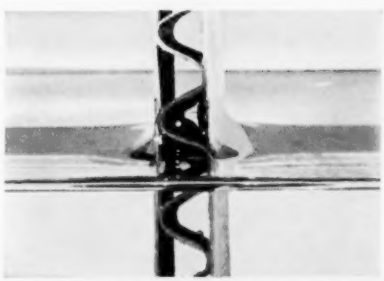
HERE, at last, is a corrugating medium that weathers grueling shipping problems that could make a soggy mass out of any ordinary container. And for surprisingly low cost!

It's International Paper's amazing new Hydro-Chem. Boxmakers now hail it as perhaps the greatest advance in corrugating materials in over a decade. Here's why:

Hydro-Chem's remarkable *wet strength* can withstand prolonged periods of high humidity, cold storage, severe weather—*even total submersion!* Hydro-Chem is ideal for shipping meat, fruit, vegetables, flowers—and for freezer storage.

New Hydro-Chem gives "long haul" performance—and, unlike coated, sized or impregnated corrugated media, has superior bonding and runability qualities.

If your shipping containers need built-in *wet strength*, it will pay you to see your boxmaker about new Hydro-Chem today.



New Hydro-Chem retains full strength even when dunked repeatedly in water.

Southern Kraft Board Division **INTERNATIONAL PAPER** New York 17, N. Y.

No. 3 in a series of Hoerner corrugated shipping container experts

THIS IS THE HOERNER SPECIALIST FOR PACKAGING SQUASHY THINGS

Bruisable products present a challenge to Hoerner Packaging experts. The squishier the better! They've learned that ingenious use of quality corrugated board can ship the most tender-skinned things without a damaging nudge. If you pack or process squashy things, call the Hoerner office or plant nearest you.

HOERNER BOXES, INC.

Corrugated specialists for Mid-America

GENERAL OFFICES—*600 Morgan St., Keokuk, Iowa* • PLANTS—*Keokuk, Des Moines and Ottumwa, Iowa Sand Springs, Oklahoma* • *Minneapolis, Minnesota* • *Fort Worth, Texas* • *Sioux Falls, South Dakota Fort Smith and Little Rock, Ark.* • *Affiliate—Cajas y Empaques Impermeables, S. A., Mexico City D. F., Mexico*

THESE FIRMS

Do Better with Doughboy

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J. P. Fritz Wholesale Co.
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Bradley Candy Co.
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Burry Biscuit Co.
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Boston Sausage & Provision Co.
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Mrs. Slaby's Noodle Co.
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Mamma's Cookies Bakeries
Cicero, Illinois

Whites Food Products Co.
Oakland, California

Pack twice as fast with

Doughboy

JAW SEALER-LABELERS

MODEL PJS

The new Doughboy Jaw Sealer-Labeler will do the work of two and sometimes three ordinary labeling machines. As soon as the bag touches the vacuum (air) control, the machine takes over and leaves operator's hands free to reach for the next bag. It automatically labels, seals, and if desired, codes and punches the package. The automatic cycle cuts operator motions, increases production speed and assures better packaging. Pneumatic pick-up assures *positive* single label delivery from label box to sealing jaws. Label clamp holding bar assures *positive* positioning of label at sealing jaw. Adjustable folding bar assures *positive* label folding.

CODER AND HOLE PUNCH OPTIONAL

Coder and Hole punch are optional. An embossed code is precision made from metal type which is easily placed in accessible holder at the front of the sealing jaw. The punch, made of high carbon steel, punches a clean edged, round hole exactly centered in label.

Doughboy

INDUSTRIES, INC.
MECHANICAL DIVISION
NEW RICHMOND, WISCONSIN, U.S.A.

For more information circle No. 226 on Reader Service Card, Page 72

NEW DESIGN AIR CLEANERS SPEED OUTPUT AT KRAFT

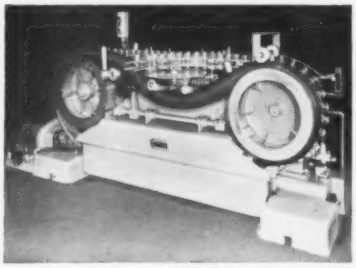
- "Sausage" type Neoprene tubes do trick
- Kraft among first to convert

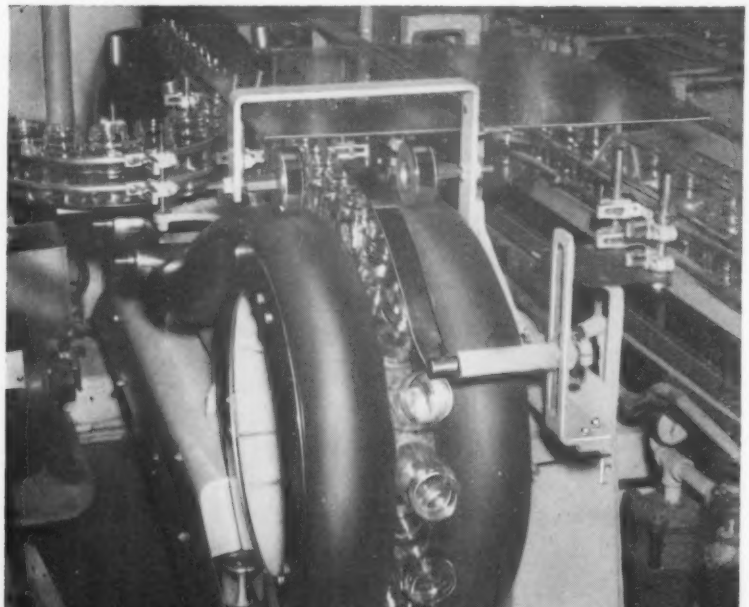
Kraft Food's Miracle Whip and Miracle French Dressing are as well known and as widely used by American housewives as their favorite brand of cosmetics. In the business world Kraft, a division of National Dairy Products Corp., enjoys a reputation as one of the nation's most able producers and merchandisers of food products.

Part, at least, of the KRAFT success is in its willingness to venture into the realm of new departures from old production principles. Pneumatic's revolutionary PNEUMACLEAN Air Cleaner is an example. Employing a never before used method of container handling—continuous air inflated Neoprene tubes—it cushions the jars or bottles gently while it inverts them, holds them firmly and moves them with record speed through the process of jet air cleaning. KRAFT quickly saw the advantages, installed the equipment and is now reaping the benefits in terms of much faster delivery of cleaned containers — 270 or more per minute.

KRAFT, a long time advocate of Pneumatic "lower cost per container" operation also uses Pneumatic equipment for filling, capping and, to considerable extent, labeling these containers.

When you're looking for the latest method of doing an automatic, or semi-automatic, packaging or bottling job look the way the leading producers in all fields do—to Pneumatic.





KRAFT runs both its wide mouth salad dressing jars as well as its narrow neck containers for a variety of sauces and dressings through its Pneumaclean units with equal facility.

PNEUMATIC SCALE CORP., LTD., 77 Newport Avenue, Quincy 71, Mass. *Sales Offices: New York; Chicago; Dallas; Rochester. Agents: Fred Todt Company at Los Angeles, San Francisco and Seattle; Rockwell Pneumatic Scale Ltd., Edgware Road, London, N.W. 2, England; O.R.M.A., Paris 8, France. Subsidiaries: Delamere & Williams Co., Ltd., Toronto; Carbert Manufacturing Co., Inc., Cambridge, Mass.*

★PNEUMATIC

A PRACTICAL PACKAGE THAT SPARKLES WITH SALES APPEAL. EACH BULB HAS ITS OWN TAMPERPROOF HOUSING OF ACETATE, ANCHORED IN A TEAR-OFF CARD INDICATING FLASHLIGHT TYPE AND SIZE.

G. E. uses Celanese Acetate for high-speed blister packaging

Five "blisters" per second . . . 300 packs per minute—that's the speed at which a newly developed machine readies General Electric flashlight bulbs for competitive selling. G. E. reports that the sheet plastic chosen—Celanese Acetate—meets all requirements of this mass-production thermoforming operation.

If you're now using or considering "blister" packs, Celanese can meet your requirements, too, with gleaming, transparent Acetate of proper strength, conformability, rigidity and toughness. You will find, as other users have, that its fine quality is an economy all the way from production line to ultimate buyer. For full details, write to Celanese Corporation of America, Plastics Division, Dept. 105-H, 744 Broad Street, Newark 2, N. J.

Canadian Affiliate: Canadian Chemical Co., Limited, Montreal, Toronto, Vancouver. Celanese®

Export Sales: Amcel Co., Inc. and Pan Amcel Co., Inc., 180 Madison Ave., New York 16.

Celanese plastics

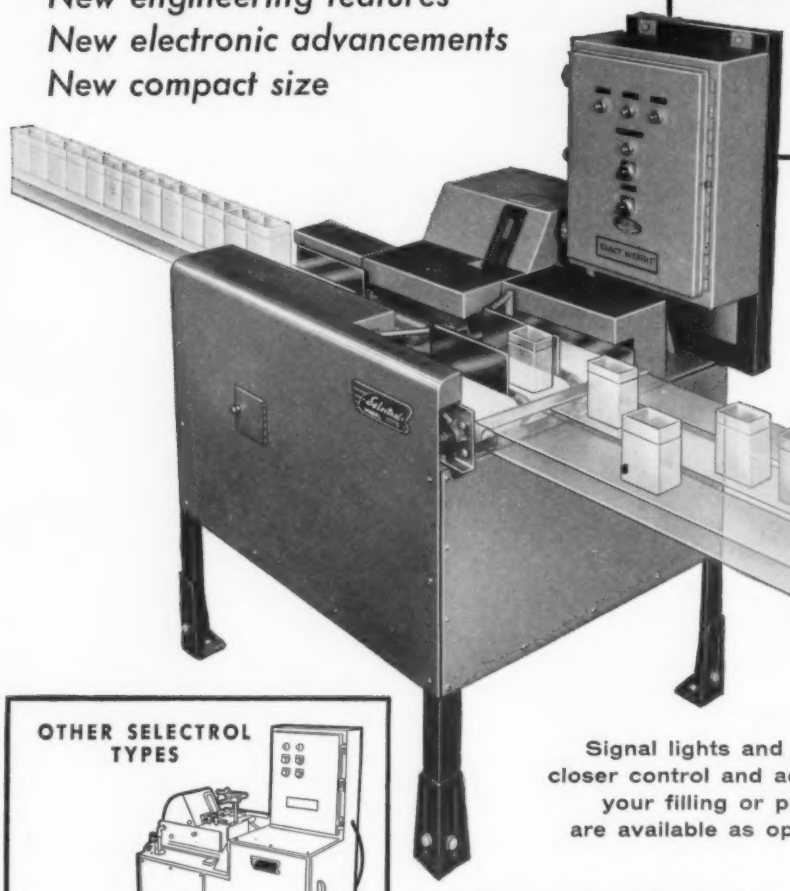
Exact Weight's New Automatic Checkweigher

New engineering features
New electronic advancements
New compact size

SELECTROL®
TYPE 1206

SPEEDS up to 120 weighings per minute.

ACCURACIES of 2/10 of one percent of the product. Greater speeds are possible at lower accuracies . . . and greater accuracies at lower speeds.



Sorts open or closed packages . . . permits trimming of rejects

Selectrol classifies, sorts and records products in an uninterrupted flow. Correct weights proceed in a straight line flow, overweights and underweights are smoothly diverted to separate lines for correction or trimming.

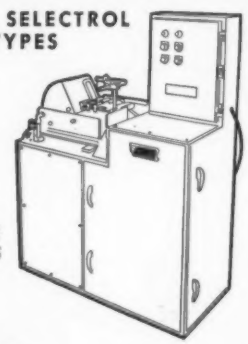
OVERWEIGHTS

CORRECT WEIGHTS

UNDERWEIGHTS

Signal lights and counters for closer control and adjustment of your filling or processing machines are available as optional equipment.

OTHER SELECTROL TYPES



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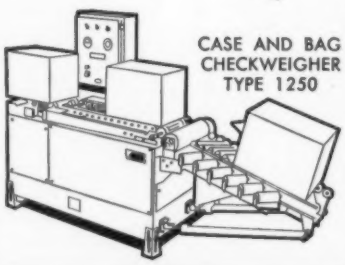

CASE AND BAG CHECKWEIGHER TYPE 1250

This new Selectrol Checkweigher, field tested and proven, is engineered to maintain the highest degrees of accuracies with relation to realistic speed requirements of most production lines. Operation is completely automatic. Tolerances are adjustable.

Selectrols are made by Exact Weight, a manufacturer of scales for 45 years, with experience gained through hundreds of checkweighing installations during the past 18 years in 28 states and in foreign countries. Write today for complete information on Selectrol and the advantages it can offer you.

THE EXACT WEIGHT SCALE CO.

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Exact Weight SCALES

Find us in your local "Yellow Pages"

Adding 270 lbs. of carton-strength with J-M Dutch Brand Strapping Tape

Dutch Brand Strapping Tape multiplies many times the weight a package can carry . . . keeps goods safe during shipment. Tough vinyl backing and strong glass strands give this strapping tape a tensile strength of 270 pounds per inch of width.

One man can apply Dutch Brand Strapping Tape with a simple hand dispenser. The pressure-sensitive adhesive holds quickly, even on irregular surfaces . . . permits using short strips instead of wrap-around lengths. Dutch Brand Strapping Tape comes from the roll cleanly, without splits. Resists abrasion. Not affected by rot, water, oil, or grease. Can be imprinted if you wish.

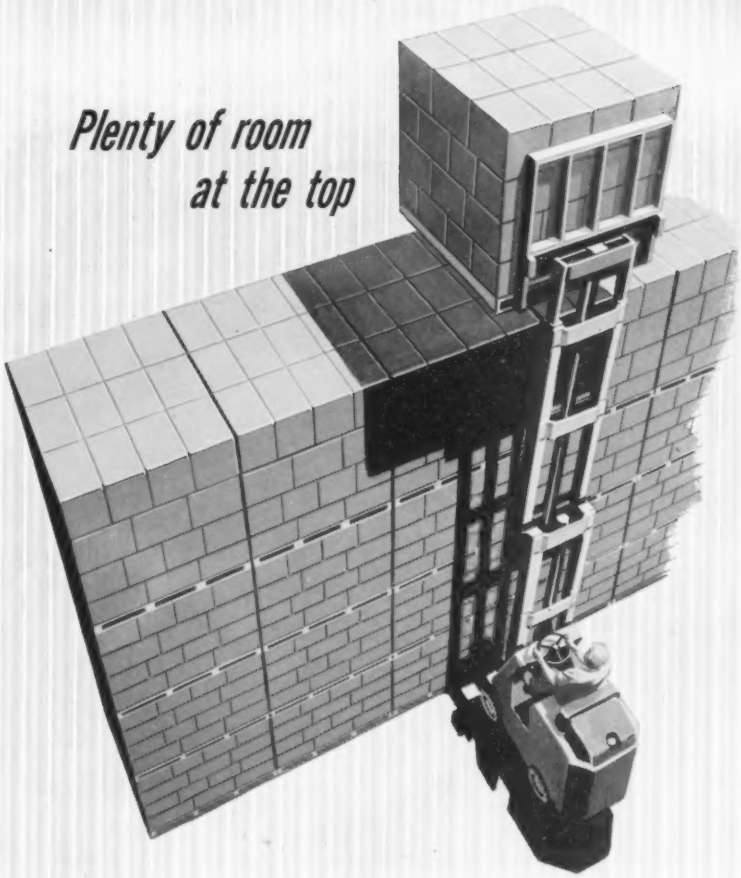
Investigate Dutch Brand Strapping Tape. See how it saves time on the line—saves work in packaging, palletizing, and bundling – saves money. See why it makes an ideal "tear-strip." Write today for new "idea book" giving dozens of profitable uses.

JOHNS-MANVILLE DUTCH BRAND DIVISION
7800 S. Woodlawn Avenue, Chicago 19, Illinois

JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE

Plenty of room at the top



Filling your warehouse space to the limit? Hinde & Dauch corrugated boxes stack high and straight. Need better top-to-bottom protection for your product? Better see H & D.

Hinde & Dauch

Division, West Virginia Pulp and Paper

AUTHORITY ON CORRUGATED PACKAGING • SANDUSKY, OHIO
15 FACTORIES • 42 SALES OFFICES

Burdet Heinemann is a graduate of Iowa State College with a B.S. degree in bacteriology. He joined Producers Creamery a year before earning his degree (in 1936) and completed his degree requirements while employed by Producers. All of his work with the company has been in research and development, and quality control. An author of numerous papers for the scientific journals and active in technical committee work, Mr. Heinemann is a member of American Chemical Society, American Diary Science Association, Institute of Food Technologists, American Public Health Association, International Association of Milk and Food Sanitarians and National Research Council.

G. G. Garbee is a graduate of Southwest Missouri State College with a B.S. degree in education. Prior to joining Producers Creamery 22 years ago, he was a high school teacher and principal. Since 1946 his work with Producers has been in the purchasing department. Mr. Garbee is a member of the National Association of Purchasing Agents. Besides holding his full-time position with Producers, he owns and operates a 112-acre farm.

Making large-scale use of bag-in-box packaging

. . . gives greater economy, efficiency and customer satisfaction

By Burdet Heinemann,
Technical Director,
and G. G. Garbee,
Purchasing Agent,
Producers Creamery Company,
Springfield, Missouri

Putting a wire-tied, 3-mil polyethylene bag containing 50 to 55 lb. of dairy products in a corrugated box for refrigerated shipping has proved very advantageous to our company. However, our success with this package has not come overnight, and we are convinced that its effective use depends on careful attention to package fabrication, packaging line techniques, as well as proper handling and use.

Our bag-in-box packaging replaced returnable 10-gal. metal cans. We were seeking a single-service package, and we suspected we could get a cost saving with its use, although at the time of starting this project, we knew little of our actual costs of returnable metal can use.

Had Many Drawbacks

We knew we were devoting too much in-plant warehouse space to metal can storage. We were having trouble getting them returned cleaned, and we were having high costs in keeping them in good repair. Also, we found that the cans were bringing bugs and infestation into our plant.

Our company has always gone to great lengths to keep our facilities free of insect infestation. In view of our care and expense in this regard, it was disappointing to find that metal cans and lids were responsible for introducing infestation to the plant. Further, there were many housekeeping and can cleaning problems. *(Turn page)*

SUCCESSFUL BAG-IN-BOX PACKAGING depends on proper care and handling of three-mil polyethylene bags before and after filling. Cut-out tabs (A) of handholes prevent fingernails from injuring bags which would cause leakage. For rough shipments, corrugated trays (B) with 1-in. turned-up edges are inserted. The empty bags are put into boxes before they reach filling line.

We made a 5-year study of the cost of our use of metal cans. We looked at replacement, retinning, losses, returns, and so on. By our most conservative estimates, we found that each 10-gal. metal can was costing us $0.70 per trip.

Now Pinpoint Costs

Our bag-in-box packaging has changed all this. We now know exactly what our costs are. We know that a cost of $0.35 includes a box, bag, closure, tape, and string—everything but a bottom tray used in certain packages. In comparing the cost of bags-in-boxes to metal cans, we do not count packaging line labor costs, but do include costs of cleaning returnable metal cans. Thus we can compare a cost of $0.35 for a 50- to 55-lb. package to $0.70 for an 83- to 87-lb. package.

Space we saved in not having to inventory cans is now used productively: We have an entire production and packaging operation in the area formerly allotted only to can storage. Also we have greater control over package weights than ever before. We now have a shelf life of 16 to 18 days, in contrast to a shelf life of 7 to 9 days under the old packaging. There is a distinct lack of complaints on product quality. Our shipments of these packages have ranged from 100,000 to 250,000 units a year.

Components Of Package

The package doing all this for us consists of the following:

1. A box of 200-lb.-test corrugated board, using Lawrence Freezur board which has a bituminous corrugating medium of asphaltic material and a moisture-resistant liner. This board is designed for use in and out of refrigeration. The structural design of our box features locking bottom flaps. This box also has die-cut handholes designed so that the handhole cut-out piece stays in place as a hinge and prevents an individual's hand from touching the bag through the handhole.

2. Where used for rough shipment, a tray with 1-in. turned-up edges, precut and scored, nontest corrugated board of C-flute. This tray also can be of 0.026 chipboard.

3. A bag made from polyethylene tubing chosen for its lack of pinholing, of 3-mil gauge, 20x34 in., heat sealed 20 in. across the bottom, and 15 in. across the top. We specify this film as medium slip, nonblocking.

4. A wire tie, 3½ in. long of 19-gauge tinned wire, loop end. Ties are prebent for convenience in using.

5. Standard gummed shipping tapes to seal boxes after filling and closing.

6. Length of string for looping and securing under closure as a means of pulling the closure through a die-cut opening in the box.

Develop Right Bag

We emphatically advise prospective users of this sort of packaging not to try to economize on either a box or a bag. Some experimentation may lead to an optimum package, but if you are to get the advantages inherent in this form of packaging, there can be no promiscuous cutbacks in package quality.

We found that a 3-mil bag is best. We started with a 4-mil polyethylene and worked down to 2½- and 2-mil material. We found the 4-mil gauge unnecessary, and we were getting too much loss with the 2½- and 2-mil material. We think that the 3-mil film is an ideal all-around gauge for our purpose. In-plant tests and practical field shipments give realistic experience concerning bag performance. We built our own tester to simulate road vibration. It is simply a motor-powered vibratory table, but it has proved a remarkably accurate guide to bag performance and is a reliable indicator of when we should use a pad or tray within the box.

Control Package Handling

We find that close control of bag fabrication, handling and storage is important. We insist that our bag manufacturing supplier make, pack and store these bags flat so that there can be no folding or creasing of bags. Any folding means an opportunity for potential bag leakage.

Also, we have set a limit of 200 to 300 bags to a box. A larger load means rough handling for the box and contents. The trouble is that such a heavier load makes it difficult for a material handler or stock man to handle the box with the care which we consider necessary. Such heavy boxes are apt to be pushed, dropped or thrown, rather than handled with the care feasible with a relatively lightweight box.

Producers Creamery Company is a pioneer large-scale user of bag-in-box packaging. Extensive experience with this packaging convinces its executives that it is profitable and efficient. Although much attention focused on Producers' initial use of bags-in-boxes, Mr. Heinemann and Mr. Garbee now review for the first time their experience in developing and refining its use and performance. They explain that one benefit of the new program is that for the first time they actually know their packaging costs.

Storage And Shipment

We specify storage conditions for these bags but find that normal warehousing is adequate. **Physical damage, rather than temperature or humidity damage, is the important factor for us to consider.** We work closely with the bag manufacturer, specifying pinhole-free, medium-slip material, and insist on correct packaging. Prospective users must work closely with their bag suppliers to see that quality bags are furnished.

We have established definite requirements for the shipment of flat corrugated boxes. We insist that railroad cars be treated with spray prior to loading, and we inspect cars and contents for infestation. Since we put so much effort into keeping our own plant clean, we try to prevent infestation from reaching us through the medium of corrugated box shipments to our plant.

Stress Careful Handling

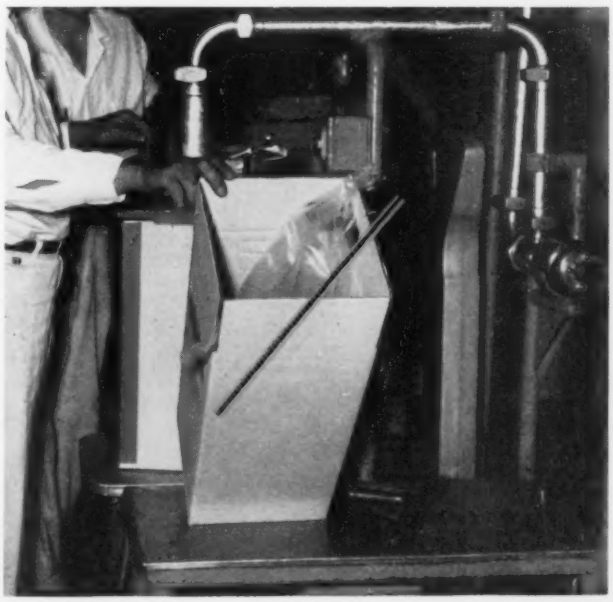
In the course of our using this package during the last four years, we have developed and refined our in-plant packaging line usage and techniques. Certain precautions are absolutely necessary. During our early days with this package, we experienced a great deal of snagging of bags by our employees. It is important to teach people to insert the bag correctly before filling.

They must guard against snagging bags with fingernails. This can result in bags leaking. Also, care is necessary to avoid snagging a bag on the box itself—such as at a flap or corner. You must remember that these polyethylene bags are vulnerable to such damage and must be kept intact in order to hold liquid products.

Another example of special care is the supervision of our simple, but effective way of affixing the wire tie to each bag. It has to be done correctly. As described in connection with the sequence of packaging operations (below), the attendant must get it sufficiently tight without twisting off the wire or fracturing the bag material.

Closure Features

This draws attention to a special feature of our bag construction. We specify our bags fabricated so that they are heat sealed three-fourths of the way across the top. **We learned from experience that you simply cannot get a tight closure when tying a bag that has a completely open top end.** There are



A THREE-MAN CREW does packaging line job, operating at 125 bags/hr. (cream) and 150/hr. (condensed milk). These two men and their partner also attend butter-churning operation in same room. Note that empty bags are positioned in boxes diagonally (black diagonal line) prior to filling. This assures that they will be in an upright position, subsequently protected against creasing.

BAG-IN-BOX PACKAGE rests on platform of scale serving specially built filling machinery. Bag is secured tightly around filling spout (arrow) to prevent air from entering bag. Filler has Micro Switch-actuated solenoid sanitary valve; product flow stops when scale trips Micro Switch on attaining desired weight.

too many folds and overlaps when you bring the material together. And once we settled on a limited opening to close, we found that wire tying is the simplest, most economical way of doing it. We tried a number of alternatives, ranging from heat sealing to string tying. We learned that once crews get the knack of using the wire tie, it works very well.

With this type of closure it is important to give proper specifications to the receivers of your packages. This closure provides the pour-spout opening our customers want. But we always warn them to cut the pour-spout opening below the string and the wire. By doing it this way, the person who makes the cut then has all loose pieces in his hand.

Without this kind of precaution, there is always the danger of some such package particle falling and being lost from sight in the depths of the bag of milk or cream. But if you cut the bag below the string and wire, you have (1) the cut polyethylene end, (2) the string and (3) the wire tie, all in your hand—and accounted for.

We also spent some time with our customers in acquainting them with the need to exercise reasonable care in handling the package. The box definitely cannot be stored on a wet floor. We suggested the use of slats 1x4 in. to keep the box out of direct contact with water.

Setting Up "Empties"

Start of this packaging operation in our plant is the assemblying of each box-and-bag combination. After a crew member sets up a box, he then inserts a bag diagonally. He does it this way to keep the bag upright when going through box flaps. Stacks of boxes containing bags then move on trucks to the filling point—about 100 packages on one cart. Since the bottom of our box locks in place, there is no taping (or stapling) of bottom flaps.

Our packaging line operation uses a three-man crew. We could do it with a two-man operation, but since it dovetails with a butter-churning operation in our plant which needs a third man, we use all three for the packaging line work. We fit our bag-in-box packaging in with the butter-churning—in the same room. Thus, we use the spare time of the butter-churning crew for the packaging job.

Products We Package

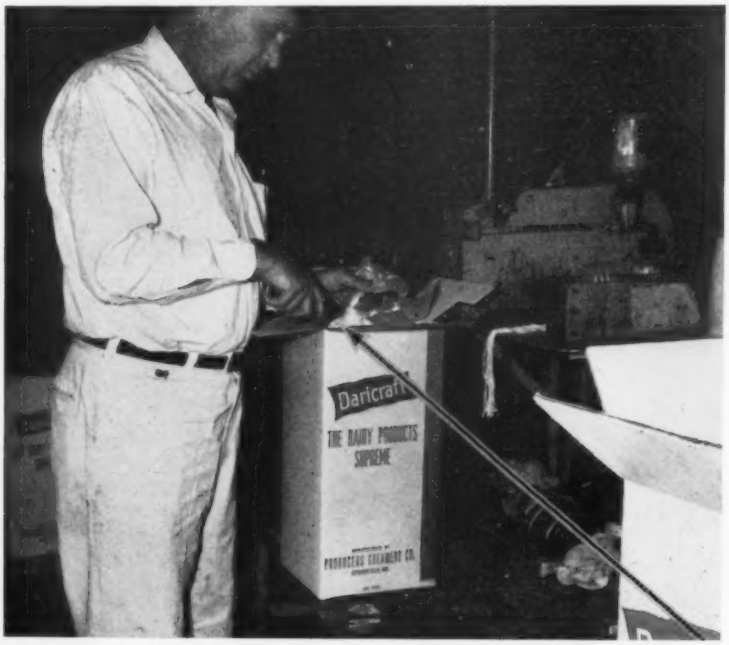
We package two basic products in our bag-in-box combination. One is a 40 per cent (butterfat) cream, 50 lb. of it going into each bag. The other product is a 36 per cent milk solids condensed skim milk. We put 55 lb. of this in each bag. We can use the same box and bag for these two products because density rather than volume accounts for the differing weights. Each one represents about a 6-gal. volume.

Our packaging line speed is 125 bags/hr. of cream, and 150 of condensed milk. We have to fill the cream by gravity although we can pump the condensed product. You cannot pump cream because doing so would result in churning it. Bags are filled to within ±1-oz. net weight.

The filling machine is of our own development. It features a Micro Switch-actuated solenoid sanitary valve, this valve itself being of Food Specialties design. After positioning a bag under the filling spout (with bag and box resting on the platform of a Toledo scale), the operator presses a button to open the stainless steel valve, thus allowing the product to flow. The bag is held tightly around the filling spout to prevent air from entering the bag. As the bag fills, the platform of the scale lowers until it attains desired weight and trips a Micro Switch which closes the air-operated solenoid, thus stopping the flow of product.

Prevent Product Spills

There is no drippage at the bottom of the filling spout since we use two (occasionally three) perforated discs in the outlet through which product flows. When the flow is shut off, there is enough surface tension in the perforations to hold in place the product remaining in the tube.



POSITIONING TIE STRING (arrow) under wire closure (string hangs out after sealing of box) permits pulling bag closure through opening in box to make package ready for use. Once packages are sealed, closed, taped, they move to refrigerated storage pending shipment from plant.

Once the package receives 50 lb. of product, the filling stops. **We have deliberately provided a manual closing of the hand switch.** Reason for this is that if the operation was automatic and if set up to stop when reaching 50 lb., it would start flowing automatically as soon as the scale pan was released by removing the filled package resting on it.

Providing a manual action makes it necessary to restart the machine to get another fill. But once it is restarted manually, filling is automatic until shutoff takes place. By having this manual actuation, there is no danger of an automatic starting of product flow with no bag in place.

Getting Tight Closures

Once filled and ready for closing, the first step in completing a bag is to twist the "ear" or open corner of the bag, put the wire tie over it, and secure the tie in place. The operator uses a standard pistol-grip twisting tool to twist the wire tie, itself already prebent to a convenient shape.

It is important for an operator to learn just how to do this. He must get it tight enough; but, if he twists too much, he either snaps the tie wire or fractures the polyethylene. It is important that he develop the knack of doing it correctly. Once he acquires the knack, an effective, speedy operation becomes second nature.

Next task is to position a tie string under the wire. This comes out as, in effect, a tear tape. Actually, the attendant makes a double half hitch with the string and lets it protrude through the die-cut opening at the closure corner of the box. The bag closure then is tucked in at the opening at this corner of the box and before taping takes place. Having a string permits pulling out the pouring spout to make the package ready for use.

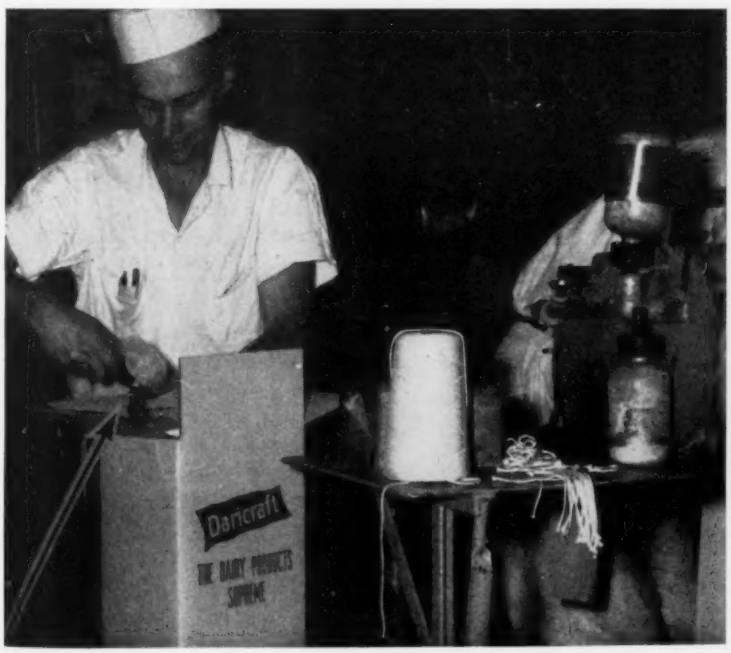
Completing Packages

Packaging line crew members use gummed tape to seal the box flaps shut and place the completed packages on skids for trucking into refrigerated storage.

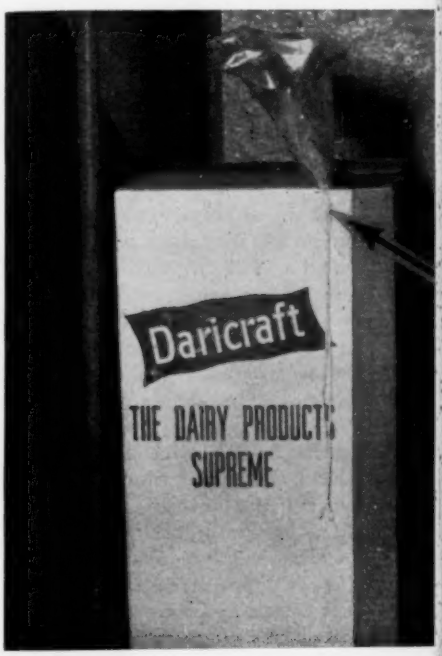
For certain shipments, such as air freight or LCL, we use a regular slotted container in place of our locking-flap box. For this RSC we use pressure-sensitive tape 2 in. wide. Since the box has a moisture-resistant coating, glue could not bite through. It is also necessary to use an inner sleeve within the box. This package costs $0.15 more than our regular one, but for certain shipments it is necessary.

In stacking we find it best to stack the boxes four high in the cooler, and we have maintained storage of test boxes stacked four high for as long as a month in a wet cooler at 40°F. But after a month, the box starts to swell. We find it helpful to use plywood separator trays in between layers of boxes. However, when making shipment, we stack boxes two high and without using the plywood trays.

Our shipping experience with bag-in-box packaging has been superior to that with metal cans. We have kept accurate claim records and find that the rate of leakers due to all causes is now running less than one per thousand packages. (*End*)



KNACK OF TWISTING 3½-in. 19-gauge tin wire tie (arrow) is important to prevent snapping wire or breaking bag. Only a 4-in. corner is open for filling, hence it is all that must be sealed. Small opening makes possible tight seal which would be impossible with bag open all across top.



READY FOR TAPING, package shows its string tie (arrow) hanging from bag closure. Before flaps of box are taped, it will be tucked in.

Oriented polystyrene

Part I: Properties and applications

By Merlin L. Evans,
Development Engineer,
Research Department,
Plax Corporation,
Hartford, Connecticut

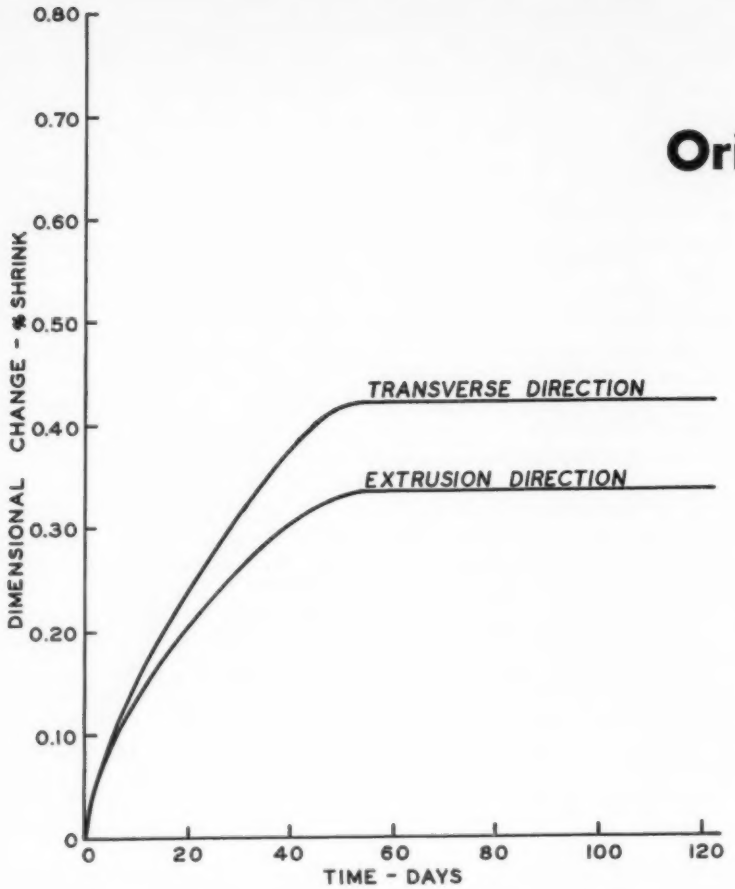


Fig. 1. Dimensional stability of 0.005-in. oriented polystyrene at 165°F. The ASTM standards (Designation: D 1463-58T) require that maximum change be less than 0.8 per cent at 160°F. within 30-day period. Shrinkage varies somewhat with gauge, extrusion conditions, and raw material.

The use of polystyrene as a base for film and sheet materials has presented a challenge to the plastics industry for many years. Its low cost, high clarity, dimensional stability, and good dielectric properties are characteristics desired in thin gauge film and sheet materials.

The use of polystyrene has been restricted in thin gauge applications because it is extremely brittle under normal extrusion methods. However, **the process of biaxially orienting polystyrene, or stretching it in two directions under controlled conditions, overcomes this brittleness and imparts increased strength, resulting in a material that retains desirable features and yet is flexible and tough.**

The thicker gauges can be formed into trays, boxes, or other shapes by thermoforming and mechanical forming techniques. The thinner gauges lend themselves to laminating, and to use as package windows and as overwrapping material.

The low specific gravity of 1.05 produces a good yield per pound (26,150 sq. in./lb./0.001-in. thickness). Rigidity and good yield plus low initial cost combine to make oriented polystyrene an economical film. However, our purpose in this article is to scrutinize oriented polystyrene in the thicker gauges —since a considerable volume of literature has already appeared on its use as a film.

PROPERTIES

Biaxially oriented polystyrene is commercially available at the present time in widths up to 60 in. and in thicknesses from 0.001 to 0.020 in. It has been produced experimentally in thicknesses from 0.0001 to 0.060 in.

It is available in a variety of colors in transparent, translucent, and opaque sheets, as well as the most commonly used colorless transparent sheet. The transparent film is lustrous and free of haze. It is odorless, tasteless, and nontoxic.

The wide gauge range and the fact that the sheet is produced with varying degrees of orientation means that mechanical properties will vary somewhat. The properties discussed herein are average values for all gauges unless otherwise specified.

Dimensional Stability

The high degree of dimensional stability of oriented polystyrene is an important property. The sheet contains no plasticizers which can evaporate and cause the sheet to shrink; it absorbs an insignificant amount of moisture, hence is unaffected by humidity.

Shrinkage due to manufacturing processing stresses is slight. **The ASTM standards (*1*) require that the maximum change be less than 0.8 per cent at 160°F. within a 30-day period. In most cases, the**

A challenge to the plastics industry for many years, polystyrene has certain properties which are desirable in a packaging material, but, due to its brittleness under normal extrusion methods, its use in thin gauge applications has been unsatisfactory. According to Mr. Evans, biaxial orientation of polystyrene results in a flexible, tough material which has many of its basic desirable features. In this first part of a two-part article on oriented polystyrene in the thicker gauges, he discusses such properties as dimensional stability, mechanical characteristics, and permeability, and cites a number of applications. Part II, which will appear in next month's issue, deals with thermoforming the material.

In an article complementary to his discussion on the properties and thermoforming of oriented polystyrene, Mr. Evans explains the theory and fundamentals of orientation, and the processes involved in bilateral orientation. This article begins on Page 42.

shrinkage of oriented polystyrene will be much less than this.

A typical example is shown in Fig. 1 (2). This sample is well within the specification, having a shrinkage of only 0.26 per cent in the extrusion direction and 0.31 per cent in the transverse direction at the end of the 30-day period at 165°F. The total shrinkage in the extrusion direction was 0.33 per cent and occurred in 54 days, after which the shrinkage remained constant throughout the test period of 347 days. The total shrinkage in the transverse direction was 0.42 per cent and also occurred in 54 days, after which the shrinkage remained steady. This shrinkage will vary somewhat with the gauge, extrusion conditions, and the raw material.

Low Moisture Absorption

In addition to providing dimensional stability under varying degrees of humidity, **the low moisture absorption of oriented polystyrene is partially responsible for the flexibility of this material at low, even subzero temperatures. This property makes the sheet a candidate for frozen food packaging.** Sheet processing which requires that the sheet be submerged in a solution, then dried, may be accelerated by using oriented polystyrene, since the base material absorbs a negligible amount of moisture.

(*Turn page*)

TABLE I

Properties Of Biaxially Oriented Polystyrene Film*

Properties	Approximate Value
GENERAL:	
Thickness Range	0.001 to 0.020 in.
Specific Gravity	1.05 gm./cc.
Area Factor (theoretical)	26,150 sq. in./lb./0.001 in.
Resistance to Sunlight:	
Indoor	Excellent
Outdoor (short term exposures)	Excellent
Light Transmission (clear)	92%
Water Absorption	0.04 to 0.06% (nil)
MECHANICAL:	
Tensile Strength	10,000 to 12,000 lb./sq. in.
Elongation	10 to 20%
Modulus of Elasticity (tension)	4.5×10^5 lb./sq. in.
Impact Strength (½x½ in. notched laminated bar, IZOD test)	Over 3.0 ft.-lb./in. of notch
Hardness (Rockwell)	M80 to M95
Orientation Release Stress	Min. 75 lb./sq. in.
THERMAL:	
Resistance to Heat (continuous)	Up to 175°F.
Thermal Expansion (linear)	$6 \text{ to } 8 \times 10^{-5}$ in./in./°C.
Thermal Conductivity	1.9×10^{-4} cal./sec./sq. cm./°C./cm.
Heat Distortion Point	207 to 210°F.
Low Temperature Characteristics	Excellent to good
CHEMICAL:	
Effect of:	
Weak Acids	None
Strong Acids	Attacked somewhat by oxidizing acids (chromic, conc. nitric)
Weak Alkalies	None
Strong Alkalies	None
Organic Solvents	Soluble in aromatic or chlorinated hydrocarbons
ELECTRICAL PROPERTIES:	
Volume Resistivity	10^{17} to 10^{19} ohm-cm.
Dielectric Strength Short Time (⅛ in. thick)	500 to 700 v./0.001 in.
Dielectric Strength Step by Step (⅛ in. thick)	450 to 600 v./0.001 in.
Dielectric Constant:	
60 c.p.s.	2.5 to 2.6
1,000 c.p.s.	2.5 to 2.6
1 mc.	2.5 to 2.6
Power Factor:	
60 c.p.s.	0.0001 to 0.0003
1,000 c.p.s.	0.0001 to 0.0003
1 mc.	0.0001 to 0.0003

* ASTM D 1463

Mechanical Characteristics

The mechanical characteristics of oriented polystyrene may vary considerably with the condition of the test sample or the test used. Extreme care should be taken, as edge effects or scratches on the surface have a pronounced effect on test results. Care should also be taken in following standard test methods.

TABLE II

Water Vapor Transmission Of Oriented Polystyrene*

Gauge (in.)	Value†
0.001	4.39
0.003	2.30
0.005	1.33
0.010	0.70
0.015	0.53
0.020	0.43

* ASTM E 96, Method E
† gm./100 sq. in./24 hr. @ 100°F., 95% R.H.

The elongation generally is between 10 and 20 per cent; however, higher values are common. Oriented polystyrene has a tensile strength of 10,000 to 12,000 lb./sq. in. and a modulus of elasticity in tension of 450,000 lb./sq. in. Other mechanical properties are listed in Table I.

Permeability

The water vapor transmission rate of oriented polystyrene (see Table II) is relatively high in comparison with other materials. This limits some uses, but is beneficial where a "breathing" effect is desired. The WVTR decreases hyperbolically as the gauge of the sheet increases (*3*). WVTR of the package depends not only on the gauge of the film but also on the nature (wet or dry) of the product to be packaged, storage temperature, relative humidity, size and shape of the package, as well as other factors.

The gas permeability of a package depends on many of the same factors, and values should be determined for a specific application. Values at a given condition are listed in Table III, but should be used with the application in mind.

In general, other factors being held constant, permeability increases as the temperature increases, with the greatest degree of protection per mil in the thinner gauges. Due to the low moisture absorption of oriented polystyrene, gas permeability does not increase with relative humidity as rapidly as it

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Orientation

Theory
Fundamentals
Bilateral processes

Here is Mr. Evans' discussion of some of the basic principles of orientation as applicable to thermoforming requirements for polystyrene. This complements the article beginning on Page 40.

Bilateral orientation was first investigated in Germany. This work led to a method in which polystyrene was extruded as a tube and stretched at controlled temperatures in two directions over a parabolic form; it was then slit and wound (*3*). The blown tube method was another early means of orienting film. The plastic was extruded through a circular die and stretched over an entrapped air bubble.

Plax biaxially orients polystyrene by a method similar to the tentering process used in the textile industry (*4, 5*). A sheet is extruded from a flat die, is longitudinally and laterally stretched, then wound. This method produces gauges from 0.001 to 0.020 in. within rigid specifications, whereas other methods are used primarily for thin gauges (less than 0.005 in.).

Another recent orienting method employs a central circular die from which a flat sheet is radially extruded and stretched by means of several pairs of draw rolls arranged around the periphery (*6, 7*).

In the process of orientation, molecules are mechanically rearranged from a random to an orderly structure exhibiting directional properties. This is accomplished by stretching a plasticized resin under properly controlled temperature conditions. Bilateral orientation is accomplished by stretching the material along two of its perpendicular axes.

Bilateral Orientation

Fig. 1 illustrates the concept of bilateral orientation. Fig. 1A is a diagrammatic section of a plastic extrudate before orientation, with the spiral molecular chains ar-

TABLE III

Gas Permeability Of Oriented Polystyrene*

Gauge (in.)	Value†			
	O_2	N_2	Air	CO_2
0.002	125	24	412	35
0.005	48	12.5	158	18
0.0075	42	11	60	16
0.010	27	7	27	9

* ASTM D 1434
† cc./100 sq. in./24 hr. @ 77°F., 1 atm.

does with some competitive films. Experimentation with coatings indicates that this transmission rate can be significantly reduced for end uses requiring lower rates.

Electrical And Chemical

The electrical properties of polystyrene were a major factor in the development of oriented polystyrene. The **high volume and surface resistivity, and the almost zero power factor,** all of which **are virtually unaffected by changes in temperature and humidity,** make oriented polystyrene useful in many electrical applications.

Oriented polystyrene shows good resistance to alkalies and weak acids; however, oxidizing acids such as chromic and concentrated nitric will attack the material. The sheet is soluble in aromatic or chlorinated hydrocarbons, though insoluble in other organic solvents. It is oil- and grease-resistant.

APPLICATIONS

The wide range of gauge and width, and the physical, mechanical, thermal, and chemical properties of oriented polystyrene sheet make possible a variety of applications. Packages for some foods and other products, container closures, laminations, and so on, encompass a partial list of end uses.

The material can be printed by rotogravure, flexographic, silk screen, or letterpress. It can be die-cut, creased, beaded, folded, embossed, laminated, metalized, and heat sealed on commercial equipment. It is formed mechanically for some end uses, but, for the most part, thermoforming is used to create desired shapes and contours.

Literature Cited

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(Part II, concluding this article, appears in our next issue.)

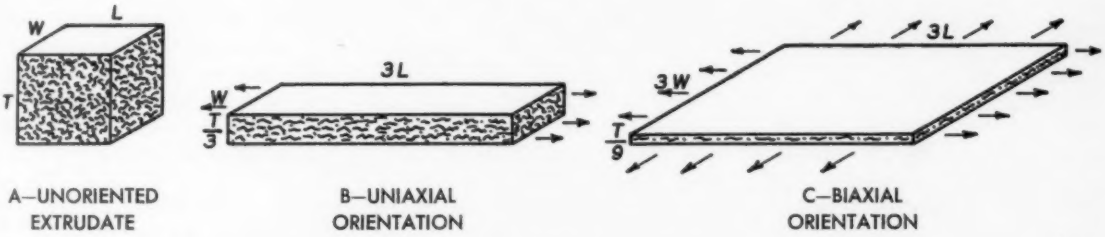

Fig. 1. Concept of bilateral orientation. Spiral molecular chains in extrudate "A" are arranged in completely random manner. Stretching plastic in ratio of 3 to 1 aligns molecules parallel to forces applied, resulting in "B." If "A" is *biaxially* stretched 3 to 1, molecules are aligned in perpendicular directions, resulting in "C." Note that biaxially oriented sheet (C) has area nine times its original, and a thickness one-ninth its original — change in volume is negligible.

ranged in a completely random manner. Stretching the plastic in a ratio of 3 to 1 (Fig. 1B) aligns the molecules parallel to the forces applied; if cooled in this condition, the **uniaxially oriented plastic will exhibit flexibility in the longitudinal direction, but will be brittle in the lateral direction.**

In order to completely eliminate this brittleness, the plastic extrudate (Fig. 1A) is biaxially stretched 3 to 1 as shown in Fig. 1C. Thus, the **molecules are aligned in perpendicular directions, resulting in biaxial or bilateral orientation.**

For most commercial applications, the biaxially oriented sheet has an area nine times the original area and a thickness ⅑ the original thickness. The change in volume of the oriented sheet is negligible. **The sheet in this condition has an elastic memory, and if heated to the heat-distortion point, it will revert to the dimensions of its unoriented state.**

Although **bilateral orientation** may be accomplished in several ways, each method **consists of four steps which are essentially the same:**

1. A resin is homogenized and extruded through a circular or flat die.
2. The extrudate is conditioned to an orienting temperature.
3. The plastic is stretched longitudinally and laterally.
4. The hot sheet is then held while a quench is applied.

Four Ways To Increase Orientation

The amount of orientation imparted to the sheet is dependent upon the temperature during stretching, the amount and rate of stretching, and the quench. Rigid control of each variable enables production of a material containing

various required degrees of orientation.

While it is difficult to isolate the total effect of each variable, in practice, the general trend may be stated by considering other variables as held constant. **Using this assumption, orientation will be increased by any one of the following:**

1. **Decreasing the stretch temperature.**
2. **Increasing the amount of stretch.**
3. **Increasing the rate of stretch.**
4. **Increasing the amount of quench.**

Stretch Temperature

When polystyrene is heated, it changes from a hard, brittle material at room temperature to a rubbery material at 182°F. **At this temperature, known as the second order transition point, the second order thermodynamic properties exhibit a discontinuity: Polystyrene now becomes pliable and formable.** Continued heating changes the resin from the rubbery state to a highly viscous liquid at 350°F. **Orientation is accomplished by stretching the material when its temperature is between 182°F. and 350°F.**

Orientation of the sheet at temperatures slightly above the second order transition point results in a highly oriented material with large internal stresses. Orientation in the highly viscous state allows many of the molecules to resume their original position after stretching; hence, much of the orientation may be lost due to relaxation.

It is very important that the extrudate be of uniform temperature. A nonuniform temperature distribution through the sheet will produce a laminar structure, and a nonuniform temperature across the sheet may cause brittle areas.

Merlin L. Evans is a graduate of The State University of Iowa with a B. S. degree. Since joining Plax Corporation as development engineer in the research department in 1957, he has worked exclusively on projects concerned with the orientation of plastics. Mr. Evans is a member of American Society of Mechanical Engineers, Society of Plastics Engineers and Society of the Plastics Industry.

Amount Of Stretch

Greater orientation may also be obtained by increasing the amount of stretch. ASTM standards (*2*) require a minimum orientation ratio, or stretch ratio, of 2 to 1 in each direction. Lower ratios may result in a brittle sheet. **Orientation beyond 3 to 1 in each direction does not appreciably increase the desirable properties of the sheet and is therefore considered optimum for general purpose sheet**(*1*).

Special applications, where additional strength is required in one direction even at the expense of decreased strength in the perpendicular direction, may require the sheet to be stretched nonuniformly, e.g., 4 to 1 longitudinally, and 2½ to 1 laterally.

Rate Of Stretch

Increasing the rate of stretch will generally increase the amount of orientation, provided other conditions are held constant. Resin being oriented at a low temperature must be oriented at a slow rate. Increasing the rate of stretching would increase the orientation and, if continued, would exceed the mechanical strength of the resin and cause fracture.

At the other extreme, where a hot sheet is stretched at a low rate, molecular relaxation will occur, and most of the orientation will be lost before the quench is applied. **In order to obtain a reasonable degree of orientation, the rate of stretching must vary as the temperature of the sheet.**

Quenching

A quench is used to cool the oriented sheet and freeze the molecules in an elongated position. The amount of quench needed is dependent upon the temperature of the sheet and the rate of stretch. **A sheet that is not cooled will lose orientation by relaxation of molecules, or in extreme cases some relaxation of the sheet itself may occur if it is released in a very hot condition.**

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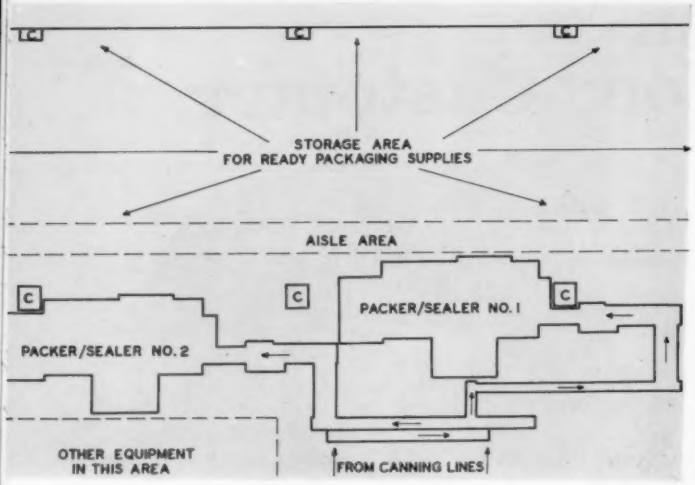
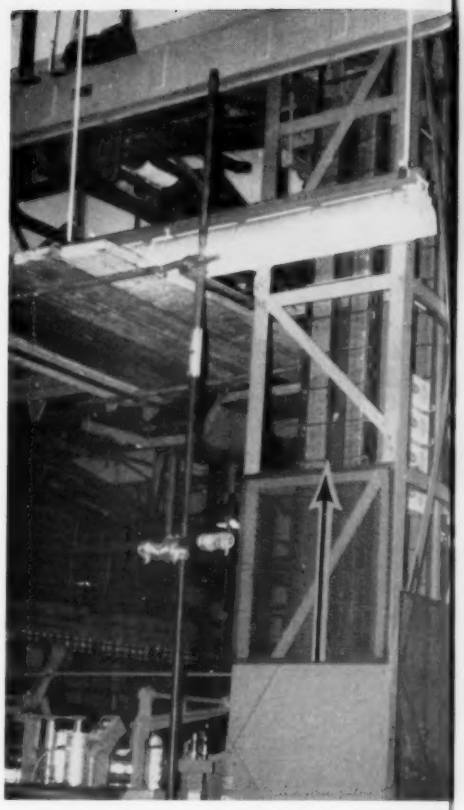


1 After reserving necessary floor space for aisles and storage of ready packaging supplies, 60x12 ft. remained for installing two case packer/sealers. This was not sufficient for two packers with horizontal compression sealers, but vertical compression units use floor space with maximum effectiveness. Note how equipment "fits" among the three structural columns (C) of the building.



2 Vertical compression sealer takes minimum amount of floor space. While sealing cases, it elevates them to conveyor system leading to palletizing area of plant. Arrangement is only method of automatic packing/sealing company can use due to limited floor space available. (Arrow shows direction of travel.)

Vertical compression sealer saves floor space

By Bruce W. Hackstaff,
Vice President,
Director of Plant and Production,
The F. & M. Schaefer Brewing Co.,
Brooklyn

With limited floor space available, the use of vertical compression sealers for our 24-pack, end-opening corrugated containers for canned beer has made automatic case packing and sealing possible on our lines. Although vertical sealers have been in existence for some time, they are designed to handle top-and-bottom-opening shipping containers. These sealers take advantage of the weight of a vertical column of filled cases to provide the necessary sealing pressure.

With our end-opening containers, it would have been out of the question to use such a method since orienting the long dimension (depth) of the end-opening case in the vertical plane would require a compression height far above the ceiling of our packaging area.

Floor Space A Factor

Over a year ago we investigated the possibility of going to automatic

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Limited floor space posed a problem for Schaefer's when it planned to go to automatic case packing and sealing of end-opening cases for canned beer. Combined thinking of the company and of the machinery manufacturer led to the development of a vertical compression sealer which occupies a minimum amount of space, and at the same time, elevates the cases to the overhead take-away conveyor system. With two of these packer/sealers utilizing the available floor space in its bottling plant with maximum effectiveness, the company operates efficiently at a speed of about 65 24-pack cases/min.

case packers and sealers for end-opening cases. **Floor space was the major factor to consider.**

Our studies showed that an area about 60x36 ft. was available at the discharge ends of our canned beer lines. (See Fig. 1.) This area consisted of two full bays and about two half bays, and contained three structural columns of the building. The 2-ft.-sq. columns are spaced 24 ft. between centers. The long dimension of the entire area is perpendicular to the direction of flow of cans discharged from the can closers.

Within this area, however, it was necessary to reserve the two full bays for aisle space and storage of ready packaging supplies. Thus, the only space available for the proposed equipment was about 60x12 ft. and included the three columns.

At the present time we operate our canning lines at a total speed of 1550 cans/min., which is equivalent to about 65 cases/min. for 24-packs. Using this rate when planning for automatic case packing and sealing, we determined that two units would be required, each operating at a speed of at least 33 cases/min. Although the 60x12-ft. area was sufficient to accommodate two case packers, it was not adequate for the equipment complete with horizontal compression sealers.

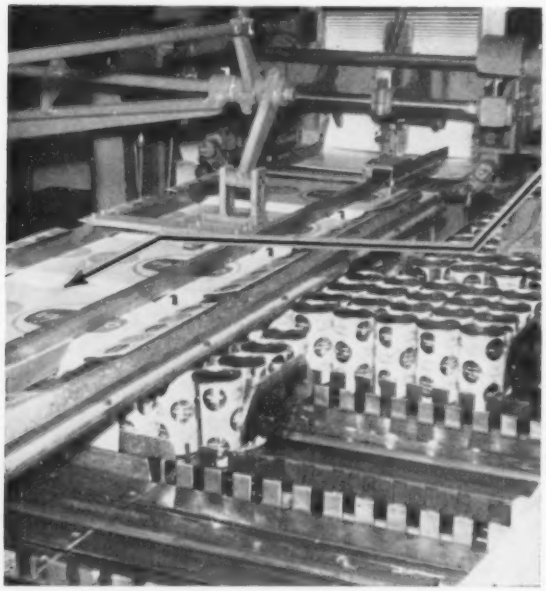
Combine Thinking With Machinery Manufacturer

Discussing our problem with engineers of R. A. Jones & Company, **a solution appeared possible if a vertical compression sealer for an end-load style case could be achieved.** We first determined that the distance from the floor line to the overhead take-away conveyor system is about 14 ft. The height of the discharge level off the case packer is 3 ft., leaving about 11 ft. maximum for the compression distance.

Preliminary tests showed that sealing of at least 40 cases/min. could be accomplished in this distance, if the cases were carried with their smallest dimension (width) in line with the travel of the vertical conveyor. This speed on one compression unit was sufficient to accommodate our output.

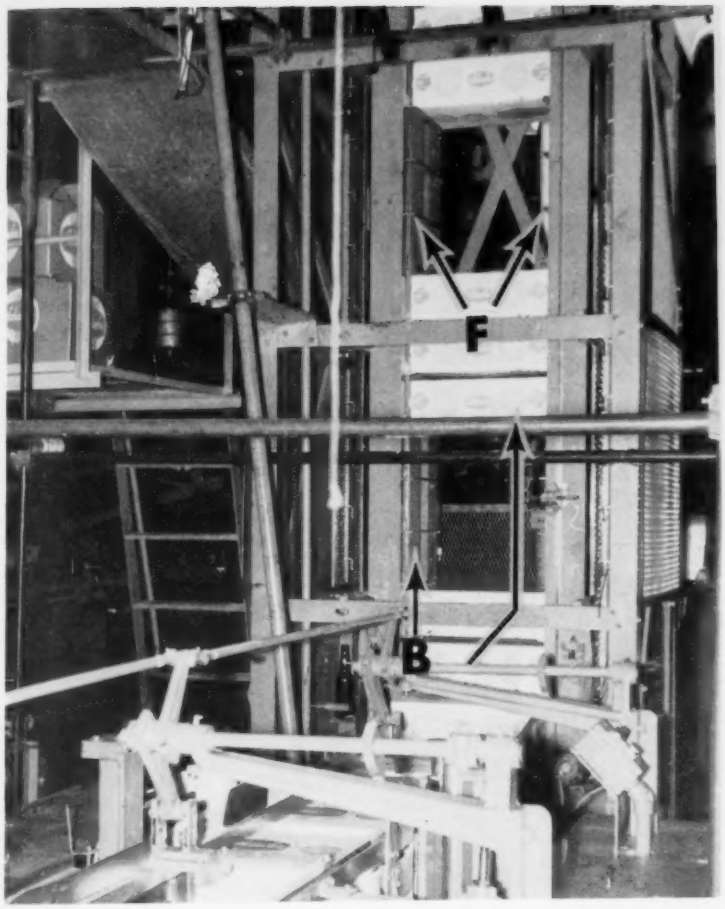
Install Equipment

With these facts at hand, the machinery manufacturer worked out the details and built a sealer to fit our needs. (See Fig. 2.) The first complete packer/sealer was installed in May, 1959 and our second unit, the following month.



3 Entering automatic case packer in normal upright position, cans are arranged in groups of 24 each, using pattern of 6x4 cans. (Arrow shows direction of travel.)

4 With flaps open, loaded cases pass vertical adhesive applicator roll (arrow). Adhesive feeds through plastic tube from pot in machine base to roll. Scaper maintains proper thickness of adhesive film.



5 Vertical compression sealer is a part of horizontal case packer. Both operate from common drive. As powered flights (F) lift cases vertically, free-moving endless belts (B) are driven by pressure between case and pressure plates (not visible as they are enclosed in vertical housing). (Bent arrow shows direction of travel.)

In order to utilize the available space with maximum effectiveness, it was necessary to place the equipment perpendicular to the direction of travel of the cans as discharged from the filling lines. Approximately 30 ft. long each, the two packer/sealers had to be placed end to end in the 60-ft. direction. **We were fortunate in being able to fit the equipment among the three structural columns**—due to the physical shape of the machines. (See Fig. 1.)

How Equipment Works

The sealed cans of beer enter the automatic case packer in their normal upright position and are arranged in groups of 24 cans each,

Bruce W. Hackstaff is a graduate of Cornell University with a degree in civil engineering. After 17 years as management consultant and field engineer, he joined Schaefer as manager of engineering department in 1950. He assumed his present position in 1955. Mr. Hackstaff is a member of American Management Association, Packaging Institute, American Society of Mechanical Engineers and Cornell Society of Engineers.

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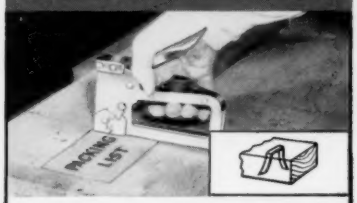

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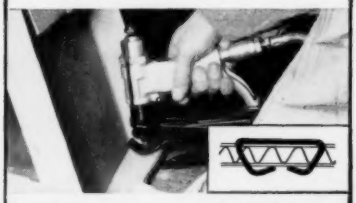

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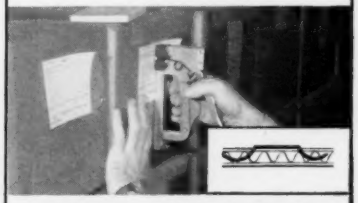

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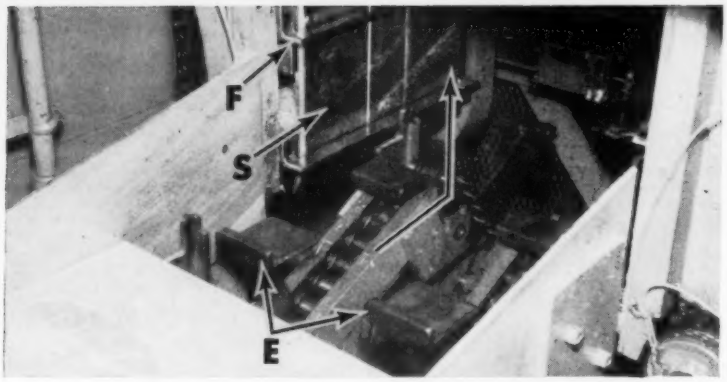
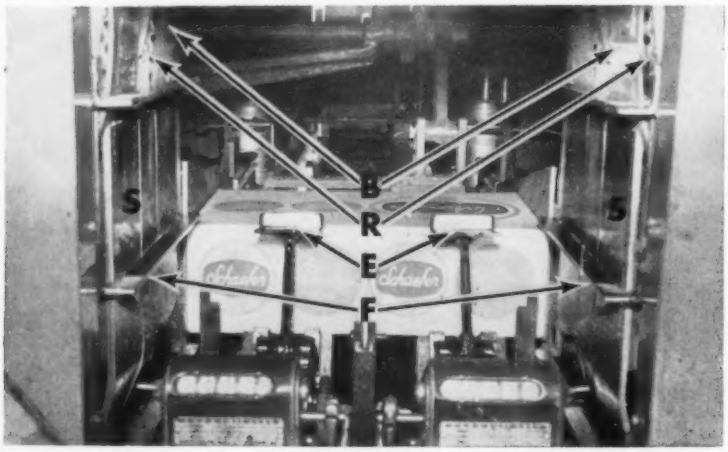


6 Escalator mechanism (E) gradually transfers case from horizontal transport flights into vertical sealer flights (F) which are powered and provide vertical lift. Case (left foreground) is approaching escalator. Stationary steel plates (S) do not contact case, thus allowing horizontal movement of case by escalator. (Bent arrow shows direction of travel.)

7 Same view as Fig. 6. Case is being elevated by escalator mechanism into vertical flights (F). (Bent arrow shows direction of travel.)



8 Looking into base of sealer in opposite direction from Fig. 6. Vertical flights (F) are spaced equidistantly, far enough apart to take width dimension of case. Free-moving endless belts (B) contact flaps. Backing up each belt is endless, free-moving roller chain (R) which is backed up by fixed pressure plate (not visible). Roller chain is similar to link type except rollers and pins are the links; thus rollers are under control. Belts and chains are driven by pressure between case and pressure plates. Counters (foreground) show accurate production count.

using a pattern of 6x4 cans. The groups are pushed into the cases which are travelling continuously downstream. (See Fig. 3.) With adhesive applied by the vertical applicator rolls (see Fig. 4), the cases approach the vertical compression section. (See Figs. 2 and 5.)

An escalator mechanism gradually transfers each case from the horizontal transport flights into the vertical sealer flights which are powered and provide the vertical lift. (See Figs. 6, 7 and 8.) Mounted on endless chains, the latter flights are spaced equidistantly and far enough apart to accommodate the width dimension of the case. As each case enters the vertical compression section, it trips a lever which operates a pair of counters, thus giving us an accurate count of our day to day production. (See Fig. 8.)

Roller Chain Mechanism

A pair of free-moving endless belts (see Figs. 5 and 8) at either end of the case is in contact with the flaps. Backing up each belt is an endless roller chain (see Fig. 8), also free-moving, and mounted back of each pair of chains is a fixed pressure plate.

The chain is similar to a regular link type except that it is constructed using the rollers and pins as the links. This construction maintains the rollers under control and results in their ability to roll freely as rolling surfaces against which the belt can move. Thus, friction between the belts and the rollers, and the rollers and pressure plates, is held at a minimum when sufficient pressure is applied to the plates to compress the case properly.

As the cases are lifted vertically by the powered flights, the belts and roller chains are driven by the pressure between the case and pressure plates. Because of the size of the rollers, the roller chains travel at a rate about half that of the belts, which are moving at the same rate as the cases.

This feature of the sealer is one of the factors contributing to our

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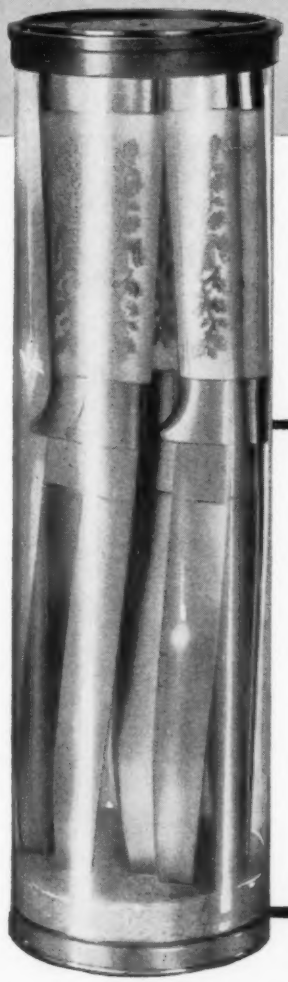

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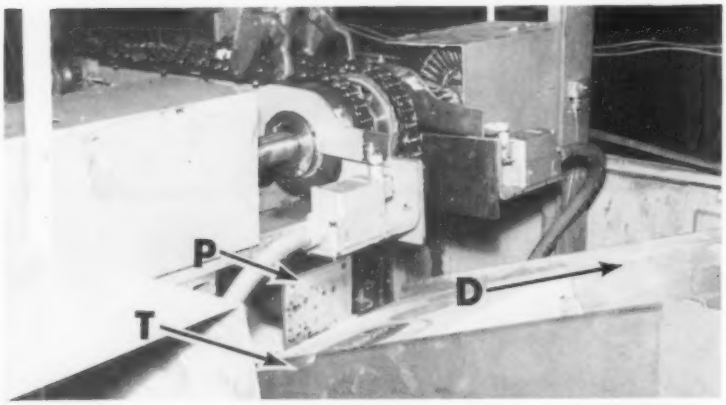
9 At top of vertical sealer, cases are pushed off vertical flights (F) by paddle (P) which transfers case onto take-away conveyor. (Bent arrow shows direction of travel.)



10 An endless belt about 3 ft. long, take-away conveyor (T) transfers cases to roller conveyor system leading to palletizing areas in another part of building. (Arrow, D, shows direction of travel.)

11 Case transfers from take-away conveyor (T) onto overhead roller conveyor system. (Bent arrow shows direction of travel.)

being able to seal our end-opening cases in the limited distance we require.

During the short vertical distance that the cases are being pushed horizontally onto the flights as they enter the sealer and also as they are being pushed out of the sealer at the top, they are not in contact with the endless belts– there are stationary steel plates which do not contact the case (see Figs. 8 and 9), thus allowing the horizontal movement.

As the cases approach the top of the vertical sealer, they are pushed off the vertical flights individually by a paddle and transferred onto the take-away conveyor, which is about 3 ft. long. (See Figs. 9 and 10.) An endless belt, the take-away conveyor transfers the cases to the roller conveyor system leading to the palletizing areas in another part of the building. (See Fig. 11.)

Install Separate Power Unit On Take-Away Belt

The take-away belt as originally installed was operated off the main drive of the case packer/sealer. With this arrangement, if anything occurred on the equipment which caused it to stop, the take-away conveyor would stop also. If this should occur at the moment a case was about to be transferred from the take-away conveyor to the roller conveyor (these two conveyors are perpendicular to one another, see Fig. 11), there was a possibility that the case in question would be stopped in such a position as to jam when the machine was started again.

To eliminate this possibility, we installed a separate power unit to operate the take-away conveyor. With this arrangement, if the packer/sealer equipment should stop automatically, the take-away conveyor continues to run and keeps any cases being discharged from the sealer moving along. Should the take-away conveyor stop, its power unit is interlocked electrically with that of the packer/sealer equipment, and the entire unit stops automatically. *(End)*

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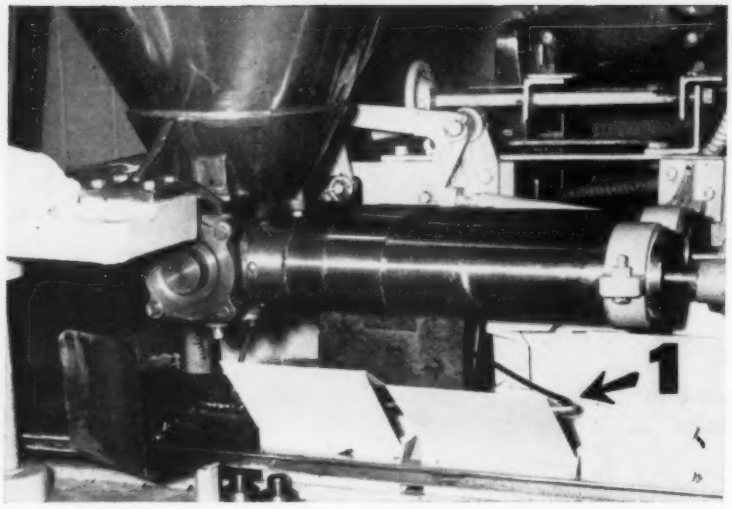

Fig. 1. Cartons move from right to left through filler, passing V-shaped heavy wire guide (1) which directs and holds carton flaps in open position. Point of "V" is toward oncoming cartons, with legs of "V" extending outward horizontally toward rear of filler.

Here is an effective contribution to jam-free packaging line flow: A combination of guides and other fixed members to guide the movement of cartons through a filler. Their use prevents a tendency of a freshly folded carton flap to spring back—or that of an empty carton to tip over if unbalanced by a flap.

How cartons travel jam-free route

V- and T-shaped guides eliminate risk of empty cartons tipping over and of carton flaps catching on machine or closing prematurely.

Use of stationary guides on its filling machinery lets Terry Foods, Inc., Park Ridge, Illinois, frozen food manufacturer, maintain steady movement of cartons without jamming. The purpose of these guides is to control the position of carton flaps at all times while moving through the filling machinery. Without these guides, cartons would tip over, close before filling, or catch their flaps on machine posts.

Using standard 16-oz. waxed, frozen food cartons, packaging line crew members position empty cartons for filling. Some products get a premeasured fill prior to entering the machine filler. For example, a carton of chop suey receives its quantity of precooked meat prior to passing under the filler to

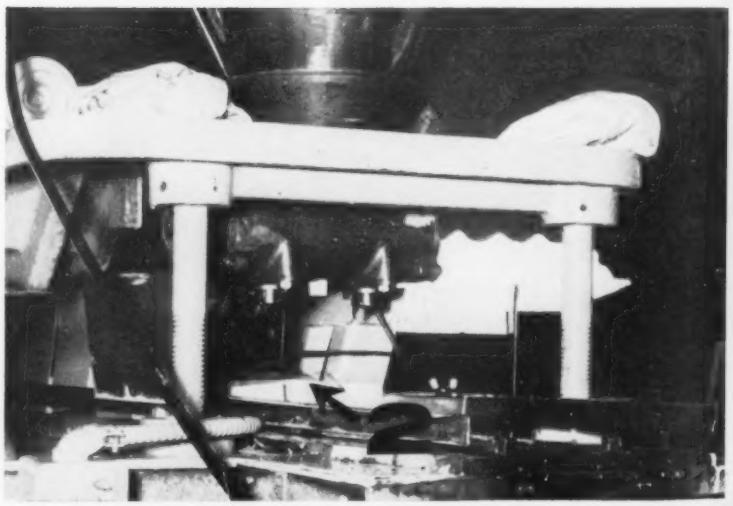

Fig. 2. Sheet metal T-shaped flap guide (2) prevents tipping of empty cartons. "T" is upside down, so cartons pass under its top, as seen at point of arrow. As cartons move in two rows side by side, each leg of "T" holds down file of cartons passing under it.

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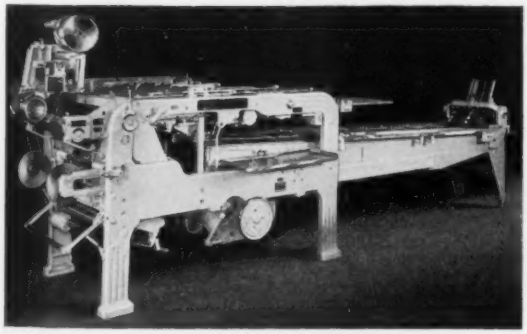

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receive vegetables and other chop suey ingredients.

Three-Step Solution

Some empty cartons show a tendency to tip over when the flap of such a carton is folded open (say, 120° or so from closed position) prior to its entering the filler. Whether empty or containing meat, other cartons posed difficulty because their flaps, although opened, would fold back toward the closed position prior to machine filling.

First, Terry production people developed a V-shaped, heavy wire guide which they positioned horizontally on the Elgin twin piston filler with the point of the "V" directed toward the oncoming cartons—entering along both sides of a conveyor line, thus feeding both filling points of the filler (See Fig. 1.) This wire guide solved the problem of flaps getting out of control—either by going shut or moving too far open. But this injected a new problem: Guiding of the flaps made the cartons tend to tip over when empty. **Next, Terry's experts developed and installed a T-shaped flap guide of sheet metal,** locating it in the center area between the two lines of cartons moving through the filler. (See Fig. 2.) This guide holds down the cartons moving on each conveyor belt.

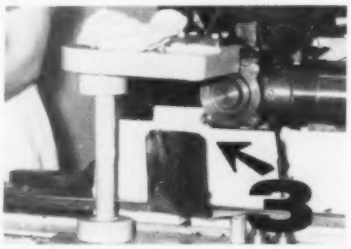

Fig. 3. Vertical guide (3) prevents carton flaps catching on machine posts in case flaps are pushed too far around.

Sometimes, carton flaps were, in effect, pushed too far when held down by the wire guide. They occasionally caught on machine posts. To overcome this the plant is using **an additional stationary vertical guide on each side of the machine.** (See Fig. 3.)

What Guides Accomplish

Now, all three double units of this combination of guides function together to assure a proper flow of cartons through the filling machinery. (There are two of each guide—to serve both rows of cartons entering the filler.) Aside from preventing the interruptions adherent in carton jamming on a line, the guides offer another advantage: They prevent the spilling of cartons after filling, and thus provide protection against having to take the time necessary to clean the machinery after a carton of fluid or semisolid product, such as chop suey, spills on it. Now, cartons move through the filling equipment normally and without spilling or jamming, are inspected and closed manually, then pass on the conveyor to an overwrapping operation. (*End*)

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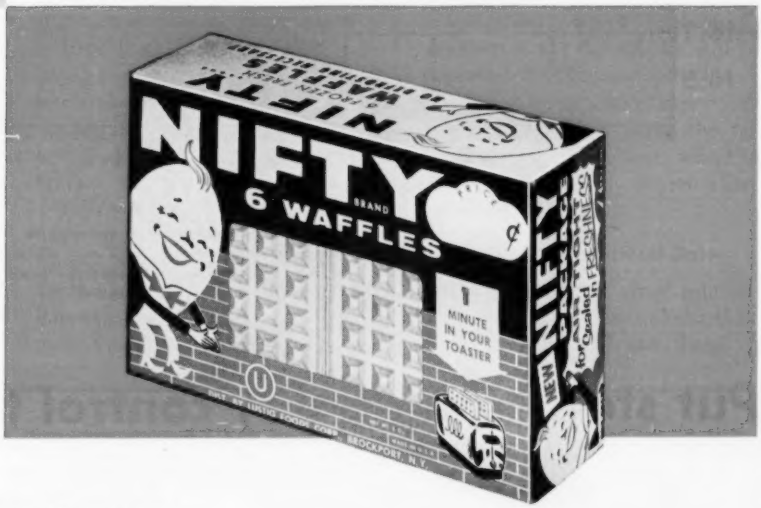
COULD YOU SAVE...

the cost of overwrapping your food package?



Overwrapping this frozen waffle package would be "lily gilding" of the first order.

The built-in qualities of Crossett Bleached Food Board combine with the "know-how" of Gordon Cartons, Inc. of Baltimore to produce this "eye-tractive" three color package that requires no costly overwrap.

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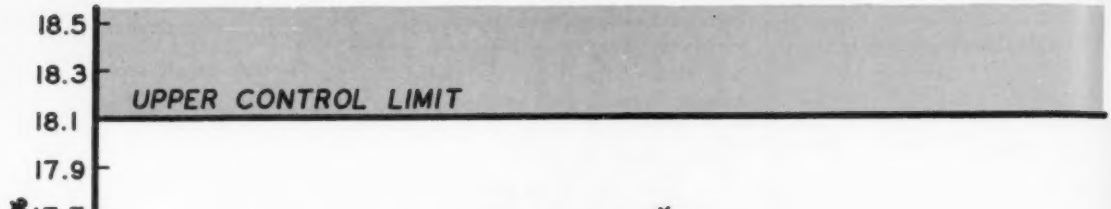


Control chart based on "historical data," shows when operation is in or out of control. Average of data (17.5 per cent) establishes mid-point; UCL and LCL determined from range (see table). If any plotted point falls outside these limits, operation is not in control. Shipping limits (different from control limits) for this item are established at 17.5 ±1.0 per cent moisture.

Put statistical quality control to work . . .

. . . *it is not too complicated*

By Francis P. Bishop, Jr.,
Assistant Director of Personnel, Chesebrough-Pond's, Inc., New York

Have you ever heard anyone say, "My company can't use statistical quality control (S.Q.C.) techniques because they are too complicated for my operating people"; or perhaps, "We are planning to institute a quality control program as soon as we can find a good statistician to set up techniques for us"? Such statements are very common today and reflect the common misconception that statistics is a mysterious subject which, if properly handled by an expert, can solve most of the quality problems facing a company or operation.

This article has been written to demonstrate some of the things that S.Q.C. can and cannot do. More important, it is hoped that some of the most valuable statistical techniques can be used by people who are not mathematically trained or experienced.

Statistical quality control is only as successful as the people who use it as a tool. This does not mean the statistician who may set up

Anything that can be measured in numerical units will give a series of figures that can be studied by statistical mathematics. This high-sounding expression is easy to understand. But the most important point of this study is to put it to work. And finding the out-of-control variations is useless unless someone takes action to correct them. Mr. Bishop uses typical data on moisture content to illustrate the principles he cites. These are just as effective as though he had used net weights, heights of fill, or dimensional figures.

the control chart, but does mean the packaging line operator or operating foreman who posts data and is in a position to *take action* based on the information the chart provides.

Control Chart – A "Picture"

A control chart is a picture which shows what is happening to a process, a machine, or almost any operation, the success of which can be measured in numbers, e.g., package net weights. It is called a control chart because most charts have what are called control limits. These upper and lower limits are determined mathematically by means of a simple calculation. **The limits are to show the point at which something has happened to an operation, which is different from what has normally happened in the past.**

Thus, the control limit on a control chart operates or functions much as the warning flag on an ice-fishing line which springs up and tells the fisherman that something, which is out of sight, has happened and that he should investigate it.

The fisherman then investigates his flag and pulls in a 6-lb. pike. The operator investigates when the plots on a control chart reach a control limit, and finds that, perhaps, because of a worn part on a machine or a formula change, his quality has changed from what he had normally considered as acceptable.

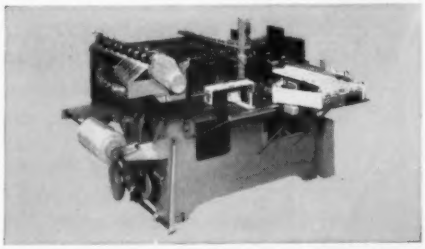
Tells you where to look. A significant point to be made is: **The control chart itself does not do anything to correct a process or to improve quality.** It cannot do any more than the flag on the fish line can do to pull in the fish. The control chart can tell an operator when to investigate and where to look.

It is the investigation and the action taken as a result of the investigation which determines whether or not the quality will be improved. S.Q.C. cannot replace a good operator or a good supervisor. What it can do is make the operator or supervisor more effective by concentrating his efforts where they are required.

Based On Historical Data

How is a control chart calculated? Where should control charts be used? Who should use them? A

Francis P. Bishop, Jr., is a graduate of Bowdoin College. He received his M.B.A. degree from the Harvard Graduate School of Business Administration in 1954. During four years with Procter & Gamble, he held a number of positions; packaging department foreman, factory methods engineer, and quality control trouble-shooter. Mr. Bishop started with Chesebrough-Pond's in 1958 as a production department manager in charge of lipstick and face powder operations. His present position as assistant director of personnel has brought him to New York from the Clinton, Conn. plant.



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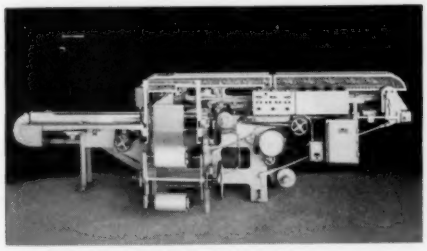

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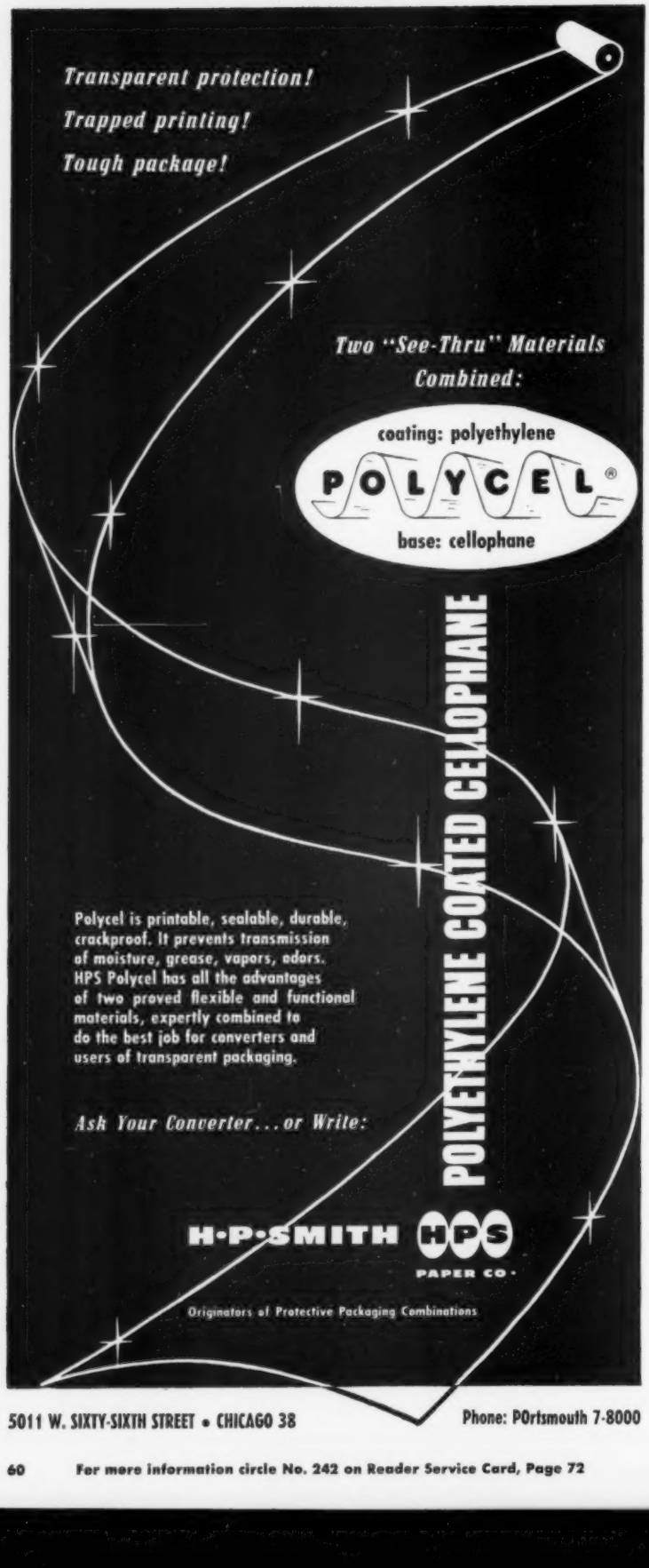
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control chart is based on historical data. We are all familiar with the use a physician makes of his clinical thermometer. By looking at its reading, he can tell whether there has been a change in the body's processes. He tells it by the change in the numbers on the thermometer, representing the patient's temperature, and the extent of their departure from 98.6°F. which he considers to be normal.

A control chart is used to "take the temperature" of a plant operation in much the same way. It should be apparent that the physician's thermometer wouldn't be of much use to him unless he knew what the "normal" reading would be. In the same way, the first thing to do in setting up a control chart is to determine what "normal" variation from our target we have been satisfied with in the past.

Develop The Chart

Let us now review the calculation of a typical chart. For the sake of this example, we will assume that we are interested in developing a control chart where the control of moisture is an important quality consideration. The same type of chart can be applied to any other operation where the success or failure of that operation can be measured in numbers. These could be net weight, volume, dimensions, etc.

Compile list of results. Before beginning the calculations, we compile a list of 30 or 40 previous results obtained when we knew that the process was under, or in, control with respect to the quality factor under consideration—in this case moisture. For the sake of simplicity of calculation we are using only 10 of the foregoing results, and listing them in the table.

Our first step in the calculations is to add up the figures and divide by the number of figures (in this case 10) to get the average. This establishes the mid-point in the chart at 17.5 per cent. (See illustration.)

The next step is to look at the results in groups of three. The rea-

son for this is to make certain that any change we may note is a significant one—not merely a chance happening. The average of the first three moisture results (first group) is 17.6. It is entered in the third column headed "Moving Average" (see table), to the right of the *third* moisture result.

TABLE
Control Chart Calculations

Date	Moisture Results (%)	3-Point Moving Average	Range
1-1.....	17.6	.....	.....
1-2.....	17.9	.....	.....
1-3.....	17.4	17.6	0.5
1-4.....	17.5	17.6	0.5
1-5.....	17.7	17.5	0.3
1-7.....	17.9	17.7	0.4
1-8.....	17.3	17.6	0.6
1-9.....	17.0	17.4	0.9
1-10.....	17.7	17.3	0.7
1-11.....	17.0	17.2	0.7
Average ..	17.5	.....	0.575

Note: Control limits are calculated as follows:

$\pm 1.023^* \times 0.575 = \pm 0.6$.

Then, UCL is: $17.5 + 0.6 = 18.1$

LCL is: $17.5 - 0.6 = 16.9$

*A number calculated by statisticians, to be used with a 3-point moving average.

Then, averaging the second group (second, third, and fourth moisture results) gives us 17.6 per cent for the next point in the column. Similarly, we calculate the other points in the column; i.e., 17.5, 17.7, 17.6, etc.

The Range

We also look at an item called "range." This is simply the difference between the highest and the lowest number in each group of three moisture results. For example, 17.9 is the highest in the first group, and 17.4 is the lowest. The difference, or range, is 0.5. Moving down through the range column, the results are figured in exactly the same way and the average range of 0.575 is calculated.

The control limits are found by multiplying the average range by ± 1.023,* and applying the products (±) to the average (17.5) of

*A number calculated by the statisticians, to be used with a 3-point moving average. A different figure must be used for 2-, 4-, or 5-point moving averages or for individual results.

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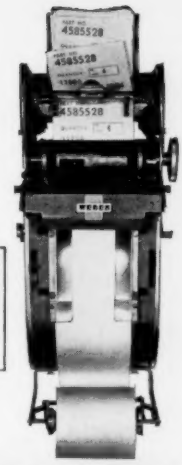

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all moisture results. The upper and lower control limits (UCL and LCL respectively) are thus established at 18.1 and 16.9 respectively and are drawn on the control chart. (See illustration.)

The 3-point moving average results can now be plotted on the chart, and future results can be plotted immediately. For example, if the next moisture result were 18.3, the next plotted point would be 17.7. (This is the 3-point moving average of 17.7+17.0+18.3= 53.0 which, divided by 3, gives 17.7.)

Result Outside Control Limits

Referring again to the example of the physician's thermometer, our experience has demonstrated that this operation under study is "healthy" with respect to moisture as long as it varies between 16.9 and 18.1 per cent. We know it to be true because, historically, this is what we have been able to accomplish in the past. If a plotted result were to fall outside these lines, we also know that something unusual has happened to affect the operation.

Shipping limit. When this happens, it is time for the operator to locate the cause and correct the condition before results exceed the shipping limits. For the sake of this example, we will assume that the shipping limits have been established at 17.5, ±1.0 per cent. The figure representing the shipping limit is a matter of company policy and is often determined by the sales department. It is not actually a control measure but really is an inspection measure.

Why Use Control Charts?

Typical questions that may be raised at this point are listed below:

1. **Why do you use a 3-point moving average** instead of plotting single points on the control chart? It takes only one bad batch to make a bad product.

We use these points because we want statistical accuracy. When we plot the 3-point moving average, we can say with 99 per cent confidence that, if the point falls outside the control limit, something has happened which represents a change from previous operations. Thus, the operator spends his time looking for real problems rather than looking for freaks for which there is no logical explanation.

Does Not Replace Operator Judgment

At the same time we should always remember that we are talking about **control limits** that are **always narrower than shipping limits.** The chart does not replace operator judgment, and, if even a single result goes outside the shipping limits, it is time to take action!

2. **Doesn't it take a lot of time to prepare and use these charts?**

A person with normal experience can calculate control limits for a process in about 10 min. Plotting daily or hourly points requires only seconds of time for a single cal-

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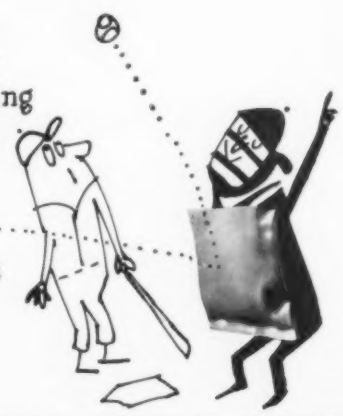

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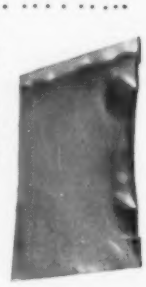

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culation (which most people can do in their heads).

3. **Isn't it dangerous, based on the example given here, to take possibly three days to recognize a process that is out of control?**

As mentioned under Question 1, the **control chart is a tool to be used with operator judgment—not to replace it.** If it is desirable, the control chart can be set up for more frequent posting, perhaps every hour.

4. **Why bother with the control chart when it doesn't tell me anything I wouldn't know from the individual moisture result?**

Eliminates Hunches

The control chart makes it possible to say with mathematical certainty that a process is in control or out of control. The chart makes it unnecessary to juggle controls, based on hunches as to whether something has happened.

Referring to the table of moisture results, if, on January 11, an operator looked at the result of 17.0 per cent, he might have had a hunch that he should increase the moisture by 0.5 per cent. If he had done so, then, instead of the hypothetical 18.3-per cent moisture (assuming that he had followed his hunch) previously mentioned, the next result would be 18.8 per cent. This is outside the shipping limit of 18.5 per cent and would result in wholly unnecessary scrap. The control chart would tell him to wait before making the adjustment because, on the chart, the process was not out of control.

Improves Quality Control

Another important value in the charts is the fact that they force the operator to pay attention to the process he is controlling. In most cases, the added attention alone, which is required to maintain a control chart, will result in improved quality control.

5. **Who should prepare and use the control charts?**

The closer the person who is actually using the charts is to actually operating the equipment, the more successful will be the application of quality control. Most operators can be trained to use them successfully.

Summary

In summary, it is not necessary to look at S.Q.C. as being too complicated for your use. There are many statistical techniques which can be used without the help of a statistician on the payroll. **The control chart is one of these techniques which many companies are using successfully to control process and packaging quality for their products.**

Look at the best operating man you know. He's the one who *knows* what is going on in his operation. Because he knows, he can plan ahead and spend much less of his time in "putting out fires." **The control chart may be an effective technique which can help to increase the potential of men in your own organization.** *(End)*

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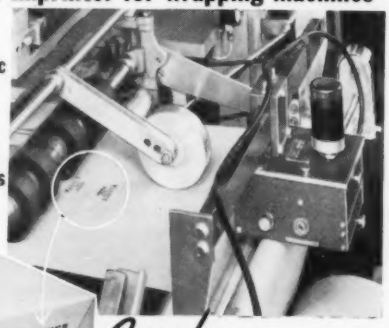

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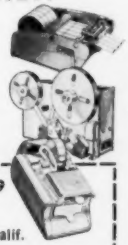

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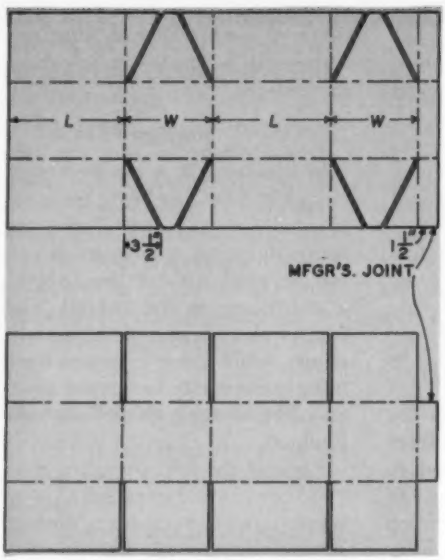


1 Blanks for diagonally slotted (DSC) (top) and regular slotted (RSC) (bottom) corrugated fibreboard containers. Note that manufacturer's joint runs *full width* of DSC blank.

Diagonally versus regular slotted containers

. . . A laboratory study of performance

By John O. Younger,
Container Technologist,
Research and Methods Analysis Branch,
Container Division,
Quartermaster Food and Container Institute,
Chicago

The idea that applying the diagonal slotting technique to containers would provide approximately the same protection attained by an RSC enclosed in a sleeve, led to the DSC concept. Showing that the principle was sound, preliminary trials resulted in a full-scale laboratory experiment which Mr. Younger describes. Covering materials, strapping patterns, testing conditions, and tests used, he traces the study step by step.

Lowered requirements for fibreboard (as much as 35 per cent) are achieved by the diagonally slotted container (DSC), developed by the Container Division.* The DSC concept evolved from the idea that approximately the same protection provided by the regular slotted container (RSC), enclosed with a sleeve, would be attained by means of the diagonal slotting technique.

No sleeve is necessary when diagonal slotting is used. Informal trials of the first prototype of the DSC showed the principle to be sound, and it was decided to conduct a full-scale laboratory investigation.

EXPERIMENTAL

Laboratory studies for the present investigation were designed to evaluate the performance characteristics of the two types of containers, DSC and RSC (see Fig. 1), with all possible strapping variations. (See Fig. 2.) Each container was evaluated in three grades of fibreboard. All containers in the top row (Fig. 2) are of the RSC type. Those in the bottom row are all DSC type containers. The strapping pattern as well as the container style is also evident in Fig. 2.

*Container Division, U.S. Army Quartermaster Food & Container Institute for the Armed Forces, Chicago.

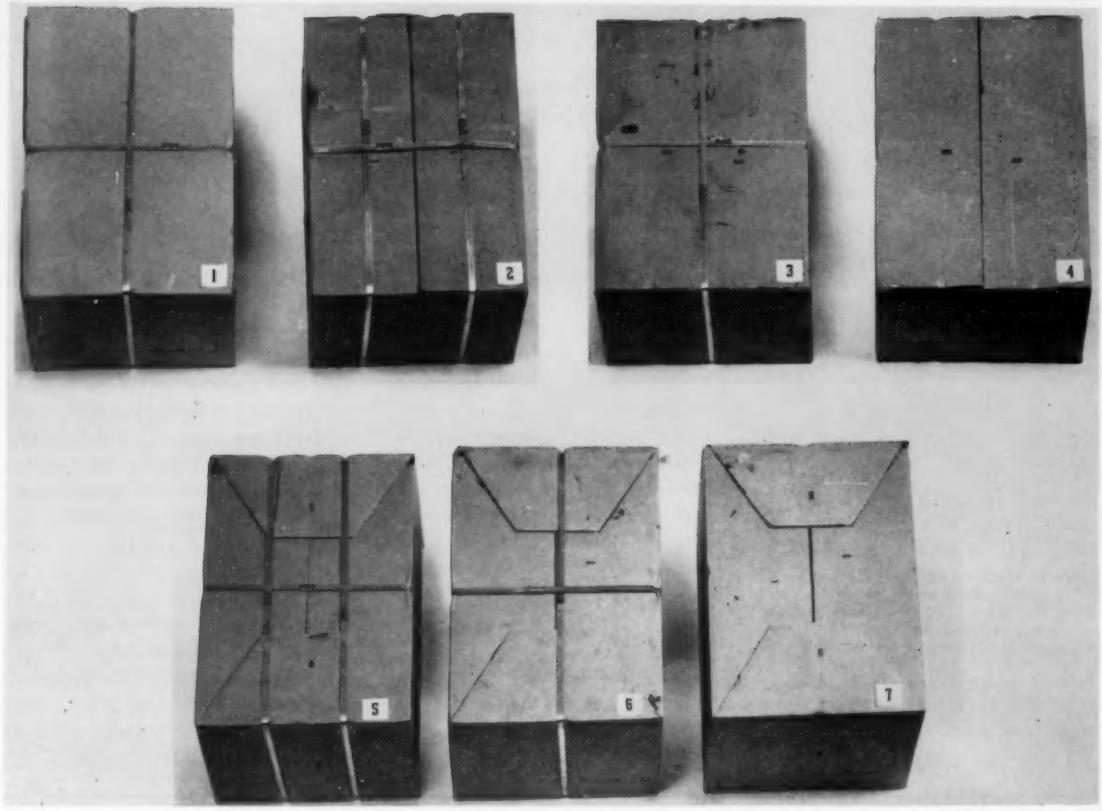
Materials Used

All test containers were of commercial manufacture and in the six No. 10-can size. Inside dimensions of the containers were 12½ ×18×9 in. Containers were manufactured in three grades of material:

1. 200-lb.-test domestic type corrugated board,
2. W5c corrugated board,
3. V3c corrugated board.

Sleeves, when used, were manufactured of the same material.

Note. All three fibreboard varieties used are described in detail in the federal specifications (2). The 200-lb.-test variety may be the most familiar to many. It is one of the usual varieties



2 Two types of containers—RSC (top row) and DSC (bottom row)—used in laboratory studies evaluating their performance characteristics. Each container was evaluated in three grades of fibreboard: (1) 200-lb.-test domestic type corrugated, (2) W5c corrugated, and (3) V3c corrugated. Note steel strapping patterns used.

the Consolidated Freight Classification Schedules. It has a minimum bursting strength of 200 lb./sq. in.

The W5c and V3c are varieties of fibreboard formerly described in Joint Army-Navy Specification JAN-P-108, and were developed primarily for military use. In addition to increased bursting strengths of 275 lb./sq. in. and 400 lb./sq. in. respectively, they also have been fabricated with water-resistant properties, one of which is retention of bursting strength of 100 lb./sq. in. and 150 lb./sq. in. after 24-hr. immersion in water.

The selection of the three fibreboards used was made in view of these considerations: The 200-lb.-test represents the bottom of the scale of corrugated board generally acceptable in normal transportation channels; the V3x represents the top of the scale for single wall corrugated; and the W5c falls in between.

The containers were made with a stitched manufacturer's joint. Both top and bottom flaps of the container were sealed, using a **water-resistant adhesive** meeting military specification requirements(*4*).

Galvanized steel strapping, ⅜ ×0.015 in., was used. Strapping was accomplished by hand operation. Strapping procedures and degree of tension, applied to the straps prior to application of the seal, were consistent with usual commercial practices.

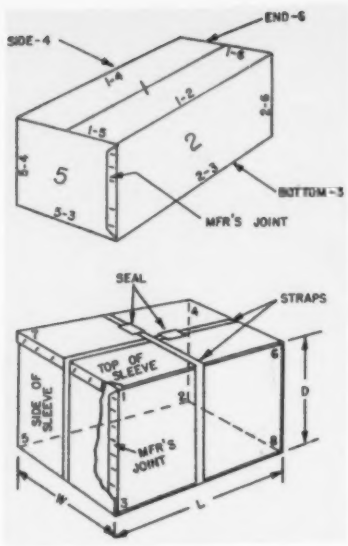
Procedure

For the test load, a No. 10 can (603×700) filled with water was employed. The cans were filled to approximately ¼ in. of their top surface and then sealed on a small laboratory can sealer.

Weights vary. The slight variability of the weights of the cans, the water content, the covers plus the variation in the weights of the containers made of different materials, caused a certain amount of weight variation in the test load. Weights varied from a 41.25-lb. mininum to a maximum value of 45.50 lb. Average for all 210 containers was 42.97 lb.

Since the increase in weight was

John O. Younger is a graduate of Lawrence College with a B.A. degree in chemistry. Before joining the Quartermaster Food and Container Institute as a packaging technologist, he was with Institute of Paper Chemistry, Northern Regional Research Laboratory, and Munising Paper Co. In 1957 Mr. Younger was awarded a Secretary of the Army research and study fellowship. To pursue the research he proposed under the fellowship, he then attended Michigan State University's school of packaging, receiving his M.S. degree in 1959. Mr. Younger is a member of Technical Association of the Pulp and Paper Industry and Packaging Institute.



3 Identification of container faces and score-line edges (upper) was in accordance with ASTM, D 775-47. Corner numbering for drop test (lower) met requirements of Federal Specification PPP-B-636, for fibre boxes.

accompanied by a corresponding increase in the strength of the container material, by the addition of a sleeve, or by additional strapping protection, the variation factor did not obscure the findings.

Testing Conditions

Although work carried on at the Forest Products Laboratory† emphasizes that control of the moisture and temperature variables is essential (*3, 5*), lack of facilities prevented such conditioning in this study. Since all tests included in this study were conducted over the same 14-day period, the atmospheric conditions were relatively constant.

While results obtained may not be directly related to earlier or future work, **the comparisons of different container types and materials, and the effectiveness of the differences in the various strapping patterns are valid.**

Evaluation

The evaluation was conducted using ten test specimens for each grade of fibreboard, each style of container, and each strapping pattern. Thus, for the three fibreboard materials, two container styles, and three strapping patterns, there were 180 containers to test. This amount plus sleeved containers for the three fibreboard materials brings the total number of containers evaluated to 210, which can be regarded as a substantial sample.

All containers were subjected to a 30-in. corner drop test. Containers were numbered prior to test to conform to requirements of the federal specification (*2*), which specifies the corner type drop test in evaluating container performance. For identification of container faces and score line edges, the numbering system established by ASTM method was used (*1*). Fig. 3 illustrates the application of these means of identification.

For drop testing, the Acme drop tester was used. Containers were dropped directly on a concrete floor. Fig. 4 shows typical effects

†U.S. Forest Products Laboratory, Madison, Wisconsin.

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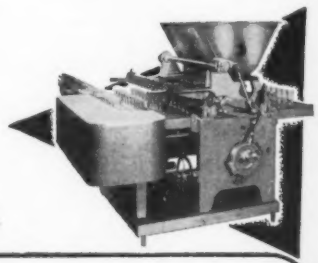

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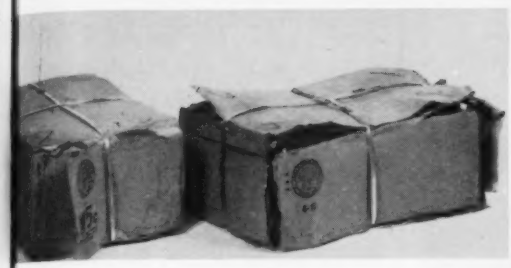

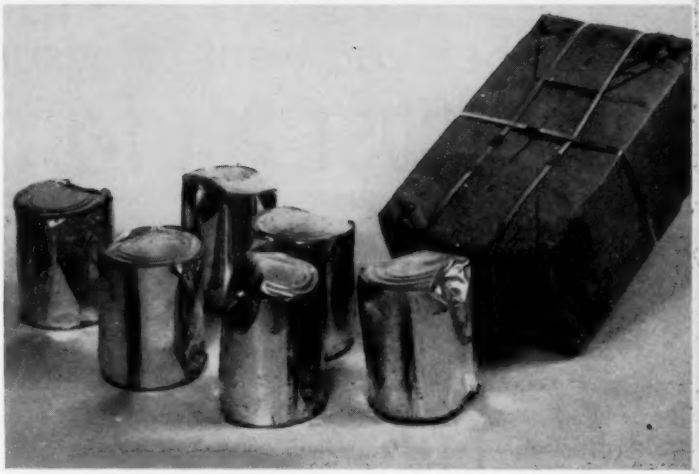

4 Typical effects of 30-in. corner drop test conducted on the two types of containers used in the experiment. Containers were dropped directly on a concrete floor. Tests used were in accordance with Federal Specification PPP-B-636. Photo at right is DSC style; above is RSC style. Note standard identification numbers on containers, according to method in Fig. 3.

of the testing method employed. The portion showing container damage will be discussed later in this article.

End Point Of Test

In this investigation, six "end-points" have been arbitrarily selected. These are as follows:

A – No. of drops to first 1-in. tear, cut, or fracture
B – No. of drops to first 6-in. tear, cut, or fracture
C – No. of drops to first complete score-line failure
D – No. of drops to spillage of contents from container
E – No. of drops to definite and serious can leakage
F – No. of drops at which testing was discontinued

End Point C. For most purposes, end point C (the number of drops to the first complete scoreline failure) **is of primary interest.** It should be noted that fracture of scorelines does not mean that the container is incapable of "containing" its contents. With all eight scorelines ruptured, a container

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without reinforcement falls apart.

However, with reinforcement, canned goods, for example, will remain contained in the unit in which they were originally packed. The cans are suitable, in fact, for further transportation and handling. **The number of drops required to cause spillage of contents from the container is, therefore, a satisfactory criterion of the suitability of the container to withstand the rigors of handling and transportation. The test may also show, conversely, that the container is much stronger than is actually required.**

If a container is made of a very weak material, the shocks encountered in transportation and handling are received by the container. **Because of its construction characteristics, these shocks are not passed on to the contents, but are absorbed by the container.** In absorbing the shock, the laws of conservation of energy prevail. In other words, the cushioning effects of the container shield the contents from harm.

In certain respects, a fragile container is therefore more desirable than a sturdy one. The fragile container will rupture after undergoing shocks of a given magnitude. The undamaged contents are thereupon discharged from the container, which will be destroyed. Actually, however, by failing, the container has protected the contents from damage. Although the spilled contents will have to be repacked, they have not been damaged by the shock to which the entire package was subjected.

At the other extreme, consider a container of sheet-metal construction. This container would not be destroyed by the "average" shock, but it would transfer the shock directly to the contents and damage or deform them.

End Point E. Let us now consider a new concept. This brings us to end point E (discontinuation of testing due to serious can leakage) as an alternate or equivalent end point. This end point, as observed from these evaluations, does not make itself evident until we

come to the containers made with the higher quality, stronger fibreboard. **In these higher quality containers, we are approaching the efficacy of the steel container.**

Table I shows that the V3c containers strapped with two lengthwise and one girthwise strap lasted for an average of 24.6 drops at which point testing was discontinued because of leakage of contents. Actual damage to the container itself was confined to small score line cuts under 6 in. in length. Actually, it required 21.2 drops (average) to reach a 1-in. score line cut; 3.4 drops later, testing was discontinued because of excessive leakage.

RESULTS AND DISCUSSION

Previous container evaluation work strongly indicated that a container of the six No. 10-can size should approximate in performance the 24 No. 2½-can size. Although it is evident that other container sizes exist, this study was undertaken on behalf of the U. S. Army Quartermaster Corps which procures a large percentage of subsistence items both in peace and war time in the No. 2½ or No. 10 cans.

Previous investigations have indicated that containers withstand stresses better with lighter weight loads. The No. 10-can size container may be expected to fail more quickly than other container sizes having equal or less weight. **This factor can be used to determine the suitability of a given container style.**

Despite the fact that temperature and relative humidity conditions vary from the established "standard" testing conditions, the test results are, within the container groups tested, reliably indicative.

Criteria For Failure/Success

Since the function of a container is to deliver its contents, a container if it is still able, despite damage, to carry its contents, need not be considered a failure. It is realized that differences of opinion may exist on this point.

For this evaluation we were not

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TABLE I

Summary Of Average Values Of Drop Test Data For The Diagonally Slotted Container

Fibreboard†	Sleeve	Strapping Pattern‡	Wt. (lb.)	Drop-Test Damage Sequence					
				A	B	C	D	E	F
200	None..	None	42.41	1.4	3.0	4.6	5.0	*	5.0
		1L & 1G	42.50	2.0	3.7	7.3	9.2	*	9.2
		2L & 1G	43.07	3.4	6.2	11.0	12.8	*	12.8
W5c	None..	None	42.64	5.6	12.1	17.0	19.4	*	19.4
		1L & 1G	42.97	5.3	11.2	15.0	18.3	16.7	17.8
		2L & 1G	42.46	8.2	14.3	19.6	27.3	21.2	22.2
V3c	None..	None	42.45	19.9	26.0	*	24.0	29.9	29.3
		1L & 1G	42.34	15.2	23.4	*	*	25.7	25.7
		2L & 1G	43.09	21.2	31.0	*	*	24.6	24.6

* Data do not exist for end points so marked.
† 200: 200-lb.-test, domestic board.
W5c: 275-lb.-test; fabricated with water-resistant adhesives; have certain water-resistant properties.
V3c: 400-lb.-test; fabricated with water-resistant adhesives; have certain water-resistant properties.
‡ L indicates lengthwise; W indicates girthwise.

concerned with damage or lack of damage to the contents. There was no intention of determining the cushioning effects or lack thereof on the different types of containers. **The sole criteria for the failure or success of the container was its ability to "contain the contents sealed therein".** Whether the contents were damaged, spoiled or scratched was not of concern under the plan of our experiments.

In addition to noting the failure point of the container, as discussed in detail in the previous paragraph, the number of drops to the first 1-in. cut, the first 6-in. cut, and the first score line failure, were also noted. For many of the containers tested, the severe leakage of the cans used as the test load caused termination of testing. Accordingly, this last point was incorporated in the tables.

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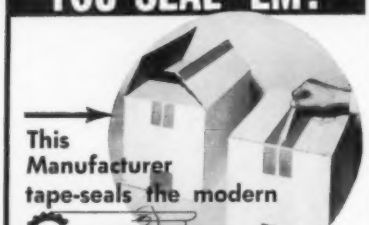

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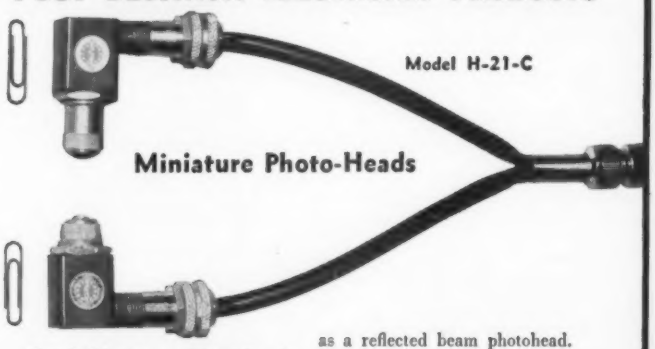

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SUMMARY AND CONCLUSIONS

Data from laboratory evaluation of a new type of container developed by the Container Division were analyzed. The procedure employed was to compare the performance of the two container types involved (diagonally slotted and regular slotted) over the complete range of the steel-strap reinforcing variations used.

By elimination of the strapping pattern as a variable it was possible to obtain comparative data on the new type of container, the diagonally slotted container (DSC), and the regular slotted container (RSC). Results show that:

1. Two lengthwise straps and one girthwise strap applied to a No. 10-can size RSC container strengthen the container to the extent that it approaches the performance of the same type of container (RSC) with sleeve.
2. The DSC container strapped in the same manner exceeded the performance of the other containers investigated.
3. The performance of the DSC container without sleeve is equivalent to that of the RSC container with sleeve.

TABLE II

Summary Of Average Values Of Drop Test Data For The Regular Slotted Container

Fibreboard†	Sleeve	Strapping Pattern‡	Wt. (lb.)	Drop Test Damage Sequence					
				A	B	C	D	E	F
200	None	None	43.06	*	1.0	3.0	3.5	*	3.5
	None	1L & 1G	42.40	*	1.0	4.5	4.4	*	4.4
	None	2L & 1G	42.59	3.5	5.4	7.6	12.5	*	12.5
	Yes	1L & 1G	43.10	1.5	4.9	7.8	12.5	*	12.5
W5c.....	None	None	42.92	1.0	3.2	7.4	8.3	*	8.3
	None	1L & 1G	43.40	1.1	3.4	7.3	11.5	*	11.5
	None	2L & 1G	43.86	6.0	11.1	14.1	17.8	17.8	17.8
	Yes	1L & 1G	44.00	10.0	18.9	23.5	28.6	26.0	28.3
V3c	None	None	42.85	3.5	9.4	11.6	14.9	17.5	15.4
	None	1L & 1G	42.78	4.5	10.4	14.3	19.1	23.0	20.7
	None	2L & 1G	43.37	14.2	22.2	28.0	*	30.1	30.1
	Yes	1L & 1G	44.18	16.1	22.9	29.3	38.0	33.1	34.1

* Data do not exist for end points so marked.
† 200: 200-lb.-test, domestic board.
W5c: 275-lb.-test; fabricated with water-resistant adhesives; have certain water-resistant properties.
V3c: 400-lb.-test; fabricated with water-resistant adhesives; have certain water-resistant properties.
‡ L indicates lengthwise; W indicates girthwise.

Literature Cited

(1) "Drop test for shipping containers," *ASTM standards on paper and paper products, and shipping containers,* Designation: D775-47.

(2) *Federal specification PPP-B-636,* "Boxes, fiber" (Washington 25: Superintendent of Documents, U.S. Government Printing Office).

(3) Kellicutt, K. Q., Landt, E. F., and Setterholm, V. C., *Basic design data for the use of fibreboard in shipping containers. Box strength calculator* (Madison, Wisc.: U.S. Forest Products Laboratory), Report No. R1911-A.

(4) *Military specification MIL-A-101A,* "Adhesive, water-resistant, for sealing fibreboard boxes" (Washington 25: Superintendent of Documents, U.S. Government Printing Office).

(5) Seborg, C. O., Doughty, R. H., and Baird, P. K., "Effect of relative humidity on the moisture content and bursting strength of four container boards," *Paper Trade Journal,* October 12, 1933.

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Case Set-Up Machine

Systemation Corp. announces its new case set-up machine, handling top-loaded and end-loaded

cases, ranging from 9x6x3¼ in. to 14x16½x11 in. A typical average speed is 11 cases/min. Cases are magazine-fed, resting vertically on edge. The operator actuates a bar which reverses the stabilizer unit to allow insertion of cases into the magazine. (The stabilizer feeds cases and maintains a predetermined pressure. This pressure is critical because of distortion, which at the pickup point is the same as excessive head pressure.) A carriage picks up each case by vacuum, rolls the case over guides, delivers it to a stop position. The carriage then delivers the case to a filling tube, and the case feeds in, is expanded by vacuum and positioned for loading — with a case loader. As soon as the case is lowered to the take-away conveyor, the next case moves in immediately and the cycle repeats. Special features of this are that the unit (1) operates in combination with any of the standard case loaders, (2) is highly adjustable, (3) is adaptable to existing equipment among case loaders, and (4) has safety features, such as a no-case shutoff unit. Circle No. 1.

Labeling Machine

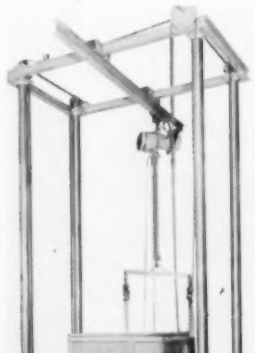
Syntron Co. has completed an automatic labeling machine that affixes 100 small-product, pressure-sensitive labels/min. Machine consists mainly of standard electromagnetic vibrating bowl-type parts feeder, 24-station indexing table and dispensing mechanism. Small products to be labeled are loaded in bulk into bowl of parts feeder which orients and feeds products into single-line feed track which delivers them at predetermined rate to indexing table. As indexing table moves a quarter revolution, product comes in contact with pressure-sensitive label, supplied from continuous reels on labeling mechanism. Once label is applied, product can be discharged, retaining oriented position, into containers. Circle No. 2.

Polyethylene Packager

General Packaging Equipment Co. reports the development of its "General Poly Packager" for form, fill, and seal packaging in unsupported polyethylene films. This single tube machine with its stainless steel tubeless folder handles a variety of products, and bag sizes up to 9 in. wide and 13 in. long. It is available as base machine with volumetric fillers or net weight scales. Circle No. 3.

Drop Tester

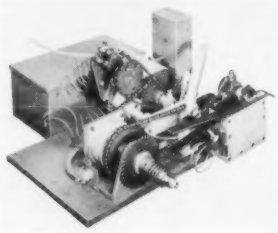
Gaynes Engineering Co. reports the development of "No. 555-DT" automatic drop tester that permits



containers to be loaded from either side of tester by electrically-operated traveling hoist and placed on rigid table leaves. Counter balanced table assembly is raised or lowered by chain assembly mechanism positioned at a corner of tester. Table leaves are electrically released by twin solenoids controlled by foot treadle. Maximum package weight capacity is 500 lb.; maximum drop height (with 48-in. container), 18 in.; table dimensions, 4x5 ft.; hoist capacity, 1000 lb., and maximum height under hoist hook is 11 ft. Circle No. 4.

Adhesive Applicator

United Shoe Machinery Corp. introduces its "Thermogrip Applicator, Model AW" that operates at



speeds up to 1000 ft./min. User can apply ½-in. band of hot melt adhesive to a 10-in. long carton at rate of 25,000 cartons/hr. Fast setup of adhesive eliminates need for pressure stations, United Shoe says. Model AW will allow high-speed gluing of plain kraft box boards and coated materials with foil, polyethylene, and a variety of waxed boards. Applicator may be mounted upright, inverted, or on its side so that surface to be glued may be passed against transfer wheel for top, bottom, or vertical surface gluing. Circle No. 5.

Fire Resistant/Vapor Barrier

American Sisalkraft Corp. announces the development of a packaging material and vapor barrier with fire retardant properties, called "Pyro-Kure." It is composed of foil and kraft paper bonded together with flame-extinguishing adhesive and reinforced with Fiberglas strands for tear and puncture-free applications. When temperature surrounding this material reaches

combustion stage, gases or vapors are released which tend to smother the flame, American Sisalkraft says. Water or weathering conditions have little or no effect on the flame-extinguishing properties, and the adhesive will not melt. Also, the material is nontoxic and will not oxidize. Circle No. 6.

Pressure Forming Machine

Auto-Vac Co., division of National Tool Co., introduces the "Pressure-Vac Mark II," a new auto-

matic pressure forming machine. Pressure forming affords fabricating cycles 4 to 5 times faster than conventional drape or vacuum forming. Forming up to 30 sq. ft./min. of any thermoplastic film or sheet, including the "critical" materials, the Mark II utilizes pressures to 150 lb./sq. in. and direct contact heating, from either above or below the material. Automatic forming cycle has five timers controlling heating, heater dwell, forming, cooling and air blow-off. Remote, push-button control permits operation from the indexing or cutting station. Forming area may be adjusted in ½-in. increments to the maximum of 11½ x21½ in. Circle No. 7.

Cotton Corrugated Wrapping

Chippewa Paper Products Co. announces the development of "Cotton-Pak," a corrugated cotton wrapping material made of soft, fluffy, moisture absorbant cotton, for protecting highly polished surfaces. "Cotton-Pak" with B-flute corrugation comes in standard 36-in. rolls or slit rolls trimming 72 in., in various size sheets and special die-cut shapes. Also supplied in sleeves and tubes, and in combinations of 35-, 50- and 70-lb. kraft liners with the cotton corrugation. Circle No. 8.

Bag Ejector

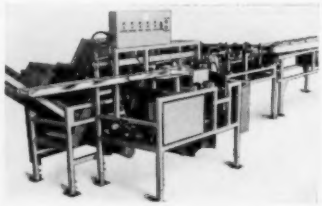
Mercury Heat Sealing Equipment Co. announces an addition to its "VLS-12" automatic label feeding and sealing machine—bag ejector which automatically releases finished package onto conveyor or accumulating table. Label-sealing unit feeds, folds and seals saddle labels up to 10 in. wide and is available with hole punch, date coder and automatic price imprinter. Circle No. 9.

Automatic Carton Selector

Atronic Products, Inc. reports the availability of its Model 405 simplified automatic carton selector which recognizes any one of seven separate printed codes. For automatic sorting, counting, and inventory control of packaged goods on assembly line or conveyor, unit may be supplied with counter and memory device to control conveyor or switches that may be activated by output signal. Self-contained light source illuminates code printed on carton so it may be read by photocells. Code consists of three parallel bars that may be printed on side or top of carton. It is fully transistorized. Circle No. 10.

Case Packer

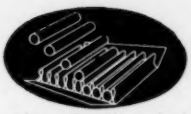
Thiele Engineering Co. reports the development of a combination machine that provides automatic



package insertion, and loads cases to give flat-pack, top-up arrangement for easy price marking. Machine takes packages from the line, places them in the proper layer arrangement and stacks them on a "miniature pallet" to form 12 units for one case pack. At the same time, shipping cases are taken from the hopper and fully formed automatically. Case is then filled with the 12-unit load on the pallet and carried through the gluing, folding and compression. Available in 12- or 24-unit pack, machine features welded square steel tubing for the frame, removable gluing parts, fully enclosed motors, water-tight wiring and plug-in limit switches. Circle No. 11.

Injection Molded Drum

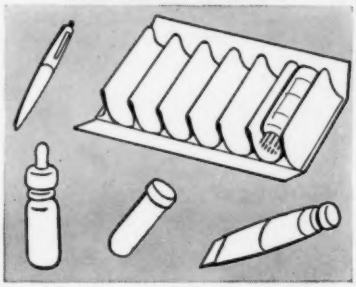
Redmanson Corp. announces the availability of its all-plastic, injection-molded 55-gal. drum and lid. Made of white polyethylene, drums have an inside diameter of



RONDO®

"the pack with the built-in shock absorber"

HOLDS and PROTECTS SMALL DELICATE OBJECTS



RONDO is a packing system comprised of trays with fluted partitions which hold inserted objects by a spring-clip action. Typical applications for medical vials, electronic components, pens, crayons, tubes, various tools, etc.

RONDO IS A PAPER PRODUCT, SOLD AT PAPER PRICES

Holds objects from 5/16" to 1¼" in diameter

RONDO OF AMERICA
INCORPORATED
100P Sanford St., Hamden 14, Conn.
Circle No. 258 on Card, Page 72

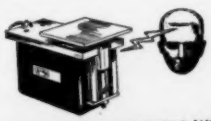
The means
AVION WEIGH

RELIABILITY
no tubes • rugged

SIMPLE
compact • easy to install

ECONOMICAL
low maintenance

plus
HIGH SPEED ACCURACY



AVION acf AVION DIVISION
acf INDUSTRIES INCORPORATED

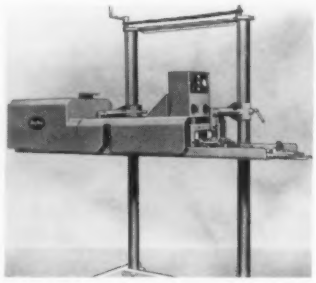
9 Park Place, Paramus, N.J.

Circle No. 259 on Card, Page 72

24 in. and stand 31 in. high, and weigh 10¼ lb. They are equipped with tight-fitting, splash-proof lids which fasten by means of a steel closure ring. They may be nested for shipping or storage. Circle No. 12.

Glue Heat Sealing Machine

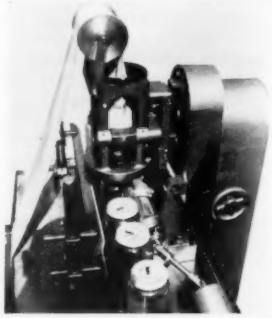
Doughboy Industries, Inc. introduces its Model CBS-G glue heat sealing machine. This combina-



tion chain-band glue sealer applies glue by a mechanically controlled pumping system which eliminates the conventional glue pot. Other features are two-stage bag top folder with each section removable independently, and carrier-chain section which supports bag for full length of machine plus continuous bands which hold folded bag top during the sealing cycle, variable speed, two-post support stand, and hand crank elevating device. An optional trimmer removes excess bag top prior to folding. Circle No. 13.

Cellulose Banding Machine

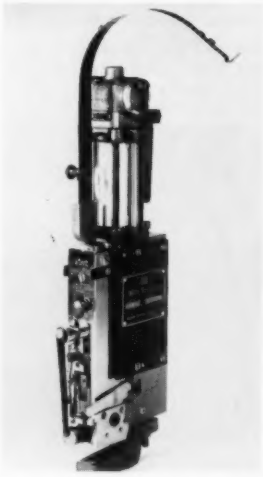
John Burton Machine Corp. introduces two new single mandrel "Cellubanders" for production



line speeds as low as 40 containers/min. The S-60 and the 1-70 use the same basic continuous motion principle, cutting and applying the individual band from cellulose tubing. Cutting of the tubing on these new machines is done by air-actuated cutting ring. Burton Machine claims these machines able to apply short length bands to wide-mouth containers. Circle No. 14.

Wire Stitcher

Acme Steel Co. reports its new "Model L Champion," an air-actuated wire stitcher designed for



packaging work. Easily mounted, machine is of particular value to manufacturer wanting to mount multiple units to stitch one object with several stitches at once. It may be grouped for various patterns of fastenings and positioned to stitch downward or upward, horizontally or at any angle. Accommodates No. 27 to No. 25 round and 21 by 25 flat wire. Circle No. 15.

Automatic Lidding Machine

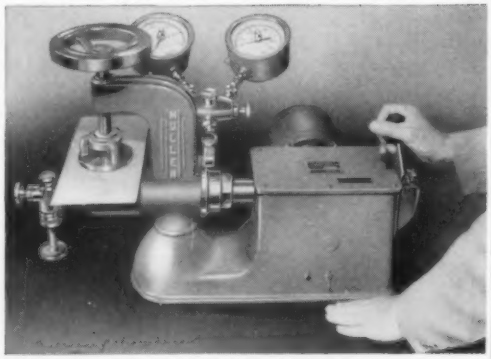
Charles Beck Machine Corp. announces its new setup lidder, a fully automatic, high-speed ma-

chine for closing filled or empty setup boxes, "in-line" with the filling operation. Built on movable casters for mobility, it is locked into position with a touch of the foot and is ready to operate. All adjustments are controlled by handwheels. Minimum box size handled, 1¼x1¼x1¼ in. — maximum, 22x14½x4½ in. Circle No. 16.

(End)

THE MULLEN TESTER

World's Standard Burst Tester for



All Types of Packaging Materials

Illustrated is the Model A for Testing Shipping Containers.
Also available is the Model C for testing paper, boxboard, and foils.

Write today for full information —

B. F. PERKINS & SON, INC.
Tester Division • Box 388
HOLYOKE, MASSACHUSETTS

DO YOU KNOW

how versatile the HUDSON-SHARP Campbell Wrapper really is?

FOR PRODUCTION VERSATILITY—

You can wrap and seal with the material of your choice — for the preservation you need and sales turn-over you expect, with a Campbell Wrapper. (1) It hermetically heat seals (including for gas flush) films and foils. (2) It heat seals other materials . . . including waxed papers. (3) It glues and/or crimp seals still other materials. Only the Campbell Wrapper does all three! In addition, you benefit from increased production because it automatically wraps single or multiple product packs—in rows, on edge, or stacked, at speeds up to 300 units per minute!

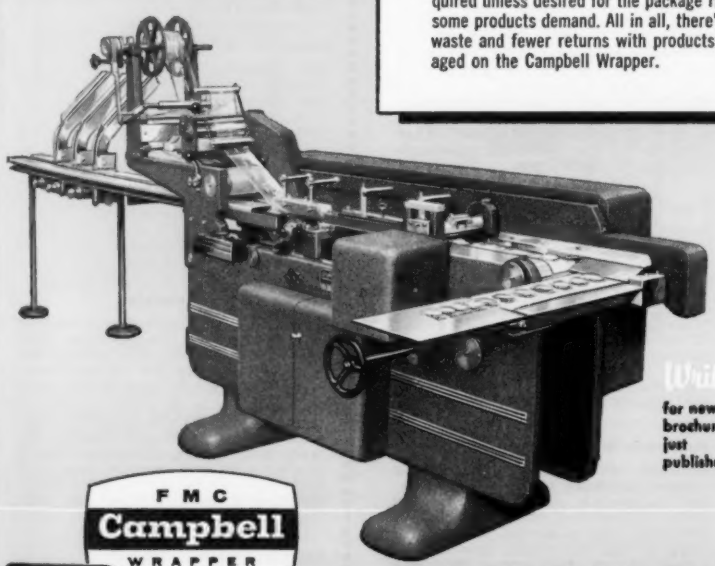
FOR DIVERSIFIED PRODUCTS—

Hard or soft — crisp, brittle or fragile . . . Whatever your product's consistency, it can be packaged on a Campbell Wrapper, without crush or breakage! Shape makes little difference either, for this machine wraps products that are square, oblong, round, oval, cylindrical, flat or irregular in shape. Campbell wrappers package a vast variety of products such as:—Crackers, Cookies and other bakery items; Candies and Ice Cream; Cheese, Bacon, Franks and Table-Ready Meats; Pharmaceutical supplies; Hardware parts; Textiles; Paper Products and 1001 varied items.

WRAPS WITH KRAFTS, GLASSINES, WAX PAPERS, FOILS, CELLOPHANE, POLYETHYLENE, PLIOFILM AND OTHER PLASTIC FILMS

FOR OPERATING ECONOMY—

Labor costs decrease with the Campbell Wrapper as in many cases it reduces help by 7 or 8 persons! Very often, one person to feed and one to pack is all that is necessary and no special skills are required. You effect important material savings, too, for this wrapper uses only the minimum necessary to cover the product and seals without costly oversize seam laps. Trays and stiffeners are not required unless desired for the package rigidity some products demand. All in all, there's less waste and fewer returns with products packaged on the Campbell Wrapper.



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Bursting Strength Tester

B. F. Perkins and Son, Inc. offers an information sheet listing seven different models of the Mullen Tester. This instrument is used to determine lb./sq. in. bursting strength of sheet materials such as paper, corrugated, and solid fibreboard, and plastic films. Pressures up to 2,500 lb./sq. in. are possible. Circle No. **101.**

Sift-/Moisture-Proof Bags

Kehr Products Co. has an illustrated information sheet which outlines the characteristics of the "Canvalope," a laminated paper bag specifically designed to handle products of extreme fineness, high specific gravity with a high sensitivity to moisture absorption, such as pharmaceuticals, baking powder, cake mixes, and so on. This package will endure severe handling. Circle No. **102.**

Moisture-/Grease-Proof Papers

Paterson Parchment Paper Co. offers a data sheet on a series of plastic-coated parchments identified as No. 27-33T. Combining a high-gloss finish, crease resistance, moisture protection, and wet strength, this paper is available in plain or printed form. It can be used as a general purpose wrapper for foods containing both moisture and fats, as a printed outer or plain inner liner for spirally-wound tubes used for packaging foods or industrial products containing oils, as a wrapper for protecting oiled metal parts against moisture, and as a carton liner for packaging moisture-sensitive products. A sample of this paper is included. Circle No. **103.**

Counting And Imprinting Machine

Pitney-Bowes, Inc. offers two pieces of literature describing the "Tickometer," a counting and imprinting machine for automatically counting, dating, coding, and imprinting labels, tags, cartons, and so on, at speeds from 500 to 1,000 pieces/min. A 10-page brochure, "Your employees' time is too valuable to waste," gives specifications and operating features of this machine. A separate bulletin of 12 case studies of savings attributed to the use of this unit is also included. Circle No. **104.**

Blister And Skin Packaging

Pyroxylin Products, Inc. has a 4-page bulletin that clarifies and explains blister and skin packaging, and describes the use of "Proxseal" heat sealing adhesives for the attachment of preformed plastic blisters and vacuum contoured skins. Compatability of various grades of "Proxseal" adhesives with various plastic films is shown. A list of companies supplying this type of packaging is included in the bulletin. Circle No. **105.**

Silicone Coatings

Dow Corning Corp. has a brochure, "Nothing sticks to paper with 'Syl-off' silicone coatings," and a list of manufacturers who make end products with "Syl-off" coated paper and those who make paper coated with "Syl-off." The brochure lists various advantages to be gained from its use. Circle No. **106.**

Case And Bag Checkweigher

Exact Weight Scale Co. has literature available on its new "Selectrol Model 1250," an automatic case and bag checkweigher. It is designed to handle cases, cartons, and bags from 20 to 100 lb. Accuracy is said to be 0.1 of 1 per cent on products within that weight range. Speeds up to 30 items/min. are obtainable. The unit is available with or without a rejector mechanism, with underweight rejection only, or with underweight and overweight rejection through the same reject channel. Circle No. **107.**

Impact Recorders

The Impact-O-Graph Corp. has a 4-page bulletin that describes various models of its impact, acceleration, and gravity recorders. These instruments are small in size, and lightweight. They record data permanently on a special wax-coated recording tape. The machines are designed to record shocks, impacts, and vibrations from any direction. A list of specifications and other features of the various models is included. Circle No. **108.**

Stencil Supplies

Reynolds Inks, Inc. has recently issued a brochure describing its various aerosol products. Some of the products illustrated are stencil inks, available in nine colors (a color card is included), layout ink, "Stencil-Kover" (a tan colored obliterating fluid), "Sherolite" (waterproofer), "Penetrol" (rust preventative), and "Collodial Graphite" (lubricant). All products are aerosol packaged. Circle No. **109.**

Automatic Wrapping Machine

Schooler Manufacturing Co. has a 4-page brochure on its "Wrapmaster" wrapping machine. It wraps using cellophane, waxed paper, or foil with seal made on longitudinal edge giving unbroken panel visibility on all four sides. Machine is adjustable from 12x7½x2½ to 2½x2x1½ in. Circle No. **110.**

Paper Bag Applications

Union Bag-Camp Paper Corp.'s commercial packaging department has a brochure illustrating applications for its custom-made paper bags for a variety of industrial uses. Some such uses include ice cream, machine parts, chemicals, ice, plastic curtains. Circle No. **111.**

Stretchable Paper

West Virginia Pulp and Paper Co. has a 4-page brochure describing its "Kraftsman Clupak," an extensible kraft paper, featuring built-in stretch allowing paper to yield on impact. Butt drop tests have shown stretchable paper to be tougher than regular kraft paper and to be able to absorb more energy. It has clean, smooth surface ideal for printing, Westvaco says. Circle No. **112.**

Polyethylene Blends

Semet-Solvay Petrochemical Div. of Allied Chemical & Dye Corp. offers Bulletin P/S 234, listing the advantages of A-C polyethylene, an inert, low-molecular weight polymer, which can readily be blended with waxes, polymers, and resins in hot-melt or water emulsifiable grades. When added to wax coating it improves gloss, reduces scuffing, and imparts a high blocking point, Semet-Solvay says. Checklist of product applications is included. Circle No. **113.**

Rotary Piston Fillers

The Pfaudler-Permutit Co. offers bulletin No. 911 which describes its line of rotary piston fillers available in four models. Designed for packaging viscous or semisolid products in speed range of 60 to 600/min., these machines can handle tin, glass and composition containers of many shapes, provided they have an open mouth of 1½ in. diameter or larger. Specifications and dimensions for each model are included. Circle No. **114.**

Carton Forming Machine

Peters Machinery Co. has a bulletin describing the "Peters-Ohio Midget," an automatic tray gluing machine. Producing up to 40 boxes/min., this unit is convertible from size to size in 20 min. or less. It forms most standard glued trays, telescope styles, hinged display cartons, and so on. This machine is available in two models, depending upon portability. It requires 36x50-in. floor area and is 83 in. high. Circle No. **115.**

Package Caser

Food Machinery & Chemical Corp.'s Canning Machinery Div. offers a 4-page bulletin, CMD 601-W, listing specifications and picturing the "Sure-Way" package caser. This machine can load rigid or semirigid

DOW **Plastiatrics**

DOW'S CLINICAL APPROACH TO HEALTHY PLASTICS APPLICATION

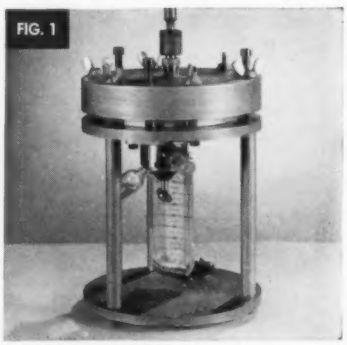
in packaging

"APTITUDE" TESTS FOR MATERIALS AND FABRICATION HELP PRE-DETERMINE SUCCESS OF PLASTIC PACKAGE

Today, a successful package calls for the best possible product-package combination. And that's where chemistry comes in. For many highly important package properties are tied closely to chemistry.

Keeping in mind the application, a packaging material ought to be inert toward the product. Permeability should be selective to moisture vapor and gas transmission. The material should have a temperature range wider than that of the product to be packaged. Chemical resistance and effects of shipping and customer handling must be considered. Ease of fabrication is important. And the proper choice of material can make these factors as permanent as possible so that best possible shelf life can be obtained.

FIG. 1



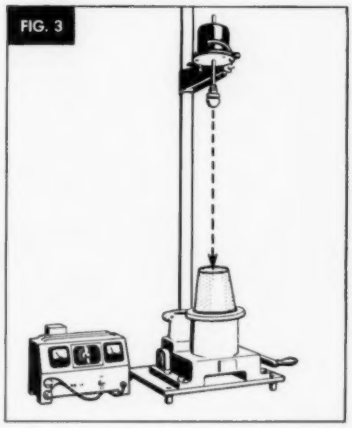
Dow, a pioneer in plastics for packaging, has developed many effective testing methods for the evaluation of these materials to help pre-determine their success in the finished package. To determine barrier properties, for example, Dow has facilities for accurately measuring both moisture vapor transmission and gas transmission. A Dow-developed apparatus has been adopted by the American Society for Testing Materials for automatically measuring gas transmission (Fig. 1) ASTM-1434-58.

Plastics are tested at Dow for compatibility with the product to be packaged . . . not only for chemical resistance, but also to determine the effect the product may have on the working stress of the plastic. A product in constant contact with the plastic may lower the working stress of the plastic. One test for determining working stress subjects the material to varying levels of stress by bending sheet over stainless steel bar bent to a constantly changing radius. The product to be tested is then placed in contact with the prestressed plastic.

Plastics are tested again in finished package form for expected shelf life and handling requirements. Fig. 2 shows results of special studies on vacuum retention, in which plastic containers were hermetically sealed with metal caps and rubber gaskets. Decreases in vacuum were measured over an extended period of time.

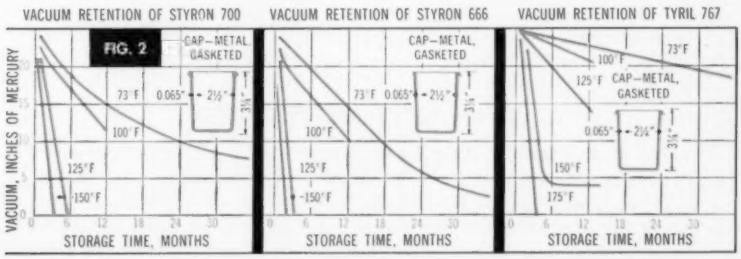
The impact missile tester (Fig. 3) further determines the ability of a plastic container to withstand rough handling. Sections of a container are placed beneath the dart and the weight of the dart is increased until the section breaks. The tester is used on containers at varying temperatures, and the critical temperature may range from —20° to 150°F.

FIG. 3



The technological developments described here are a continuing part of Dow's constant search for improved plastics and packaging performance. Detailed reports on these and many other tests . . . as well as technical information on other phases of package engineering . . . may be obtained by writing to THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department 2173DH8.

FIG. 2



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Styron* • Ethocel* • Tyril*
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THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New types of Patapar® give you a

REAL BARRIER

against penetration of

GREASE, FATS, OILS

As an inner protective barrier for multiwall bags . . . or wherever a grease-proof material is required, new types of Patapar Vegetable Parchment meet the most exacting requirements. These special grease-proof Patapars stop penetration. Oil will not spread on Patapar's surface. There is no grease "crawl".

Wet-strength, too

Permanent high wet-strength is another quality of the many different types of Patapar. And, made from pure cellulose, Patapar is odorless, non-toxic. It is furnished plain or colorfully printed.

If you would like to test Patapar for your product, write us telling your requirements. We'll send information and samples of the type we recommend for your purpose.

Patapar®
VEGETABLE PARCHMENT
HI-WET-STRENGTH · GREASE-RESISTING
HEADQUARTERS FOR VEGETABLE PARCHMENT SINCE 1885

OTHER PATERSON PRODUCTS
*PARCHKIN art parchment
*DURAPAK parchmentized cellulose
*PATAX waxed paper
*PATERSON custom made papers

PATERSON PARCHMENT PAPER COMPANY
Bristol, Pennsylvania
Sales Offices: New York, Chicago
West Coast Plant: Sunnyvale, California

packages into a variety of corrugated case sizes, either top- or end-loading, at speeds up to 240 pkgs./min. Circle No. **116.**

Polystyrene Packages

The Dow Chemical Co. has released a 24-page "Supplement to a catalog of packages." Illustrations and specifications of over 60 different polystyrene container styles are included, as well as the names and addresses of molders producing them. Square, round, rectangular, and irregularly-shaped containers, vials, and tumblers are available. Circle No. **117.**

Fibre Cans

R. C. Can Co. offers an 8-page, illustrated catalog on its convolutely and spirally wound fibre cans available in square, oval, round and obtions, pictures of 12 different specialty metal-end tops and of 7 kinds of moisture- and grease-resistant wraps and liners available. Circle No. **118.**

Package Testers

L. A. B. Corp. has literature that describes its three different package testers. Its incline-impact testers and vibration testers range from 400 to 10,000 lb. capacity, with table sizes up to 8x12 ft. A drop tester handles packages up to 100 lbs. Price sheets, specifications, and mechanical drawings are included. Circle No. **119.**

Carton Filler And Sealer

Triangle Package Machinery Co. offers a brochure giving operating details and specifications for the "Flexi-Matic" carton filler and sealer. Recommended for plants filling 4,000 or more cartons/day, this machine forms the carton, seals the bottom, fills it, shakes it, seals the top, and passes it through a compression dryer. A pamphlet inserter is available as optional equipment. This unit is equipped with net weighing scales or can be furnished with auger or volumetric feed. Circle No. **120.**

Label Gluer

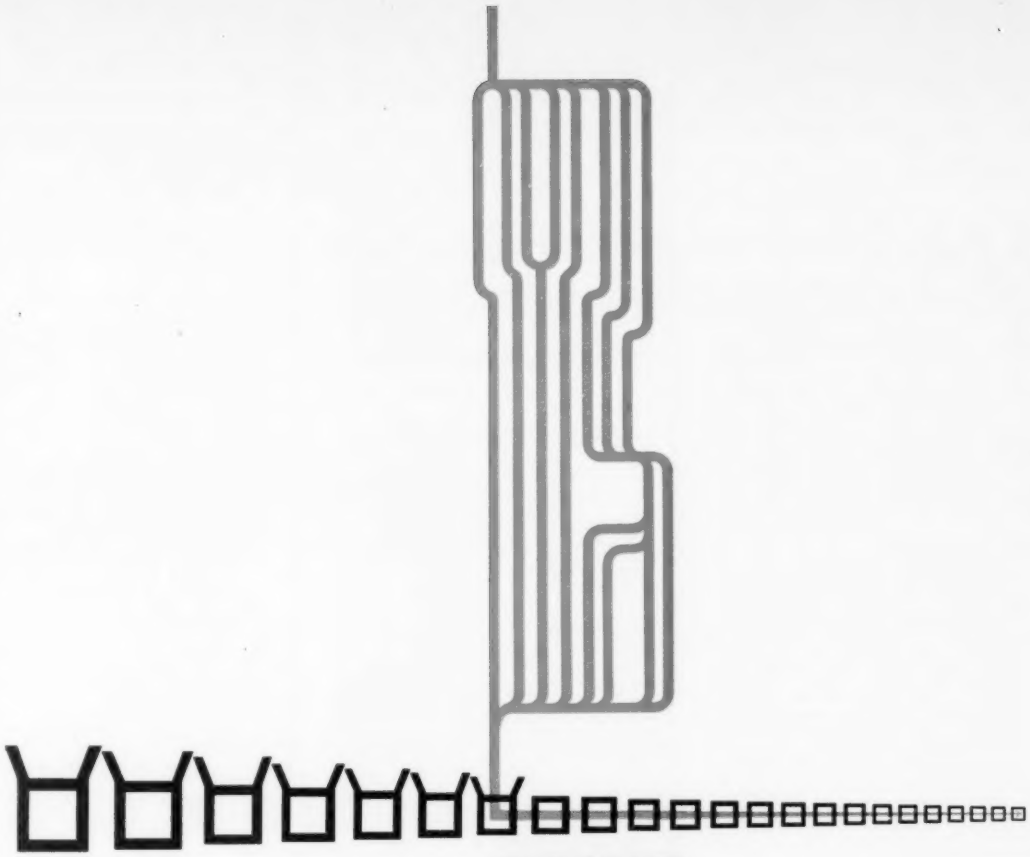
King Sales and Engineering Co. offers a 2-page bulletin on its Model F6 label gluer. Line drawings illustrate machine details and pictures show in-plant usage. Detailed specifications are listed for motor- and hand-drive units. Circle No. **121.**

Automatic Cartoners

R. A. Jones & Co., Inc. offers an 8-page brochure on two models of its "CMV" automatic cartoning machines. These units take a flat carton from a magazine, open it, tuck bottom flaps, convey open carton past manual loading stations, tuck top flaps and deliver the loaded carton. Cartons handled range from ½x¾x2½ to 4¼x4¼x9 in. Circle No. **122.**

Multiwall Bag Closer And Sealer

International Paper Co., Bagpak Div., offers a brochure listing the advantages of its Model DA bag packer and giving specifications and dimensional sketches. This machine applies a closure to multiwall bags which is proof against sifting, contamination, infestation, and moisture. It is recommended for packaging high-priced products such as hydroscopic chemicals, plastics, flour, food products, insecti-



POINT OF NO RETURN

In your plant, your product gets all the best of it . . . you control the materials and methods, the care and inspection that make it right. Beyond the point of packaging, you lose this control. From that point on, your product will have the safety and handling efficiency its package permits—and no more. In the market place, your product will have the sales appeal its package communicates—and no more. Your best control over what happens beyond the point of packaging is in your choice of packaging supplier.

CONTAINER CORPORATION OF AMERICA CCA 38 SOUTH DEARBORN STREET, CHICAGO 3, ILLINOIS

cides, and fungicides. It is mounted on casters for easy portability. Circle No. **123.**

Label Imprinter, Cut-Stacker

Oliver Machinery Co. has an illustrated brochure describing its "806 Label Imprinter, Cut-Stacker." This machine imprints roll-fed labels with whatever legends are desired —counts, cuts and stacks them at rates up to 140 labels/min. Especially suitable for pre-packaged items. Circle No. **124.**

Acetate Fibre Tapes

Minnesota Mining and Manufacturing Co. has a 6-page illustrated bulletin describing its "Scotch" brand acetate fibre tapes. These are tapes with a cellulose acetate film backing which is reinforced with rope paper tissue. They are resistant to moisture, have high adhesion, are long-aging, and are available in 12 colors or transparent. A table is included which lists the thickness, tensile strength, stretch, and adhesion ratings for eight different types of this pressure-sensitive tape. Circle No. **125.**

Bundling Machine

Crompton & Knowles has an illustrated data sheet listing specifications for its Model B bundler. Using cellophane, glassine, kraft paper, plastic base films, etc., this machine can bundle products for the automotive, bakery, drug, and food fields. Speeds range from 30 to 80 bundles/min., within a size range of 2½ to 6 in. wide, and ⅛ to 1¼ in. high. Automatic printing or wrapping material can be achieved with accessory equipment. Circle No. **126.**

Liquid Filling Machines

M.R.M. Co., Inc. has an 8-page catalog describing and giving specifications of its gravity-, vacuum- and volumetric-fed liquid filling machines. These machines will handle every type and shape container (glass, metal or plastic) from fractional oz. to carboys. The catalog is divided into 4 parts—fully automatic rotary type fillers, semiautomatic straight line, special machinery covering odd shaped containers and aerosols, and available accessories. Circle No. **127.**

Steel Drums

Vulcan Containers, Inc. offers literature on its various types of drums. Included in one folder are descriptions of open-head and tight-head drums (both open- and tight-head), grease drums (120- and 100-lb. capacity), and 55-gal agitator drums. All drums are available with a choice of interior: Plain steel, rust preventative, or "Hi-Bake" protective lining. Exteriors on all drums may be painted to individual specifications. Circle No. **128.**

Cappers And Sealers

Resina Automatic Machinery Co., Inc. has a brochure showing ten different models of its line of bottle and jar cappers and edible oil can sealers. Semiautomatic and fully automatic models are described. Speeds range from 20 to 200/min. Circle No. **129.**

Engineers' Checklist

Riegel Paper Corp. has a packaging engineer's checklist for the selection of flexible packaging materials. This list not only covers 21 points which a packaging engineer must check, but also has an enumeration of simplified explanations of factors that arise in material selection. Circle No. **130.**

Screw Capping Machine

Camco Sales, Tite-Cap Machine Div., has literature on its single-head, fully automatic screw capping machine. Output of up to 60 containers/min. is possible and the machine is equipped with adjustable speed drive so that the output may be regulated according to requirements. Fragile plastic caps and metal caps of all sizes and shapes are handled by this machine. An improved chuck with flexible jaws combined with an adjustable tension device helps prevent breakage of plastic caps. Circle No. **131.**

Plastic Vials

Lermer Plastics, Inc. has an illustrated data sheet listing various sizes of its stock line of plastic transparent vials. Available in minimum quantities of 1,000, types include threaded vials with metal screw caps, shoulder vials with polyethylene slip-on caps, or shell vials with polyethylene plug closures. Sizes range from ½x2 to 1x4 in. Circle No. **132.**

Vacuum Filler

Machinery Service Co. has a brochure that lists various features of its M-S rotary vacuum filler. Available in 12-, 18-, or 24-filling tube models, the unit is designed for high-speed filling of any free-flowing liquids, light or heavy, foamy or syrupy. Circle No. **133.**

Case Marking And Taping

Marsh Stencil Machine Co. offers "Products Folder-57," illustrating and describing its marking and stenciling equipment. Stenciling machines are available in hand- or electrically-operated models that cut letters ¼, ½, ¾ and 1 in. high. Fountain stencil brushes are reviewed as well as a variety of inks. Two electric tape dispensers are described. Circle No. **134.**

Packaging Checklist

Metal Edge Industries offers a packaging checklist that covers packaging and its relation to storage problems, inventory control, box assembly, materials handling, packing and shipping, warehousing, and display at point of purchase. The checklist can be used to measure present packaging program. Circle No. **135.**

Aerosol Products

The Risdon Manufacturing Co. has an illustrated 16-page booklet on its aerosol activities—manufacture and development of valves and complete dispensers. Valves described include the "5210" (for metal containers), the "GB" (for glass, plastic and small containers), the "Micro-Mist" for three-phase products or ultra-fine spray. Also described is i ts manufacture of complete aerosol dispensers and its variety of and protective caps. Circle No. **136.**

Specialty Industrial Inks

Markem Machine Co. has a folder describing its many different specialty inks. These inks feature fast drying speed, good adhesion, durability, color, and special properties, all discussed in the folder. The inks range from liquid to a recently developed solid form and can be used for many kinds of identification and decorating purposes. Circle No. **137.**

Gumming Equipment

New Jersey Machine Corp. has a six-page folder describing its complete line of gumming equipment. These units include table models and automatic machines for spot gumming, strip gumming, for labels, linings, and case-marking. Circle No. **138.**

Bottom-Loading Case Packer

W. F. & John Barnes Co. has available a 4-page, illustrated brochure on its new automatic case packer (Model L-20) for bottled goods featuring bottom loading—which means bottles are raised up into case inverted instead of dropping in. Slightly curved lifter fingers raise bottles causing them to fan out so they enter compartments with almost no contact with dividers. Basic machine consists of infeed laned conveyor, pattern-collecting station, case-loading station, carton positioner, and carton discharge mechanism. Brochure includes side-view line drawing and "Output and adjustment specifications" chart. Circle No. **139.**

Coatings

Interchemical Corp.'s finishes division offers a brochure covering its line of protective and decorative coatings for paper and foil. It gives physical constants, application data and suggested end-uses for naphtha varnishes, high-gloss lacquers and polyester coatings, low M.V.T. coatings, sanitary coatings and linings, heat seal, nonslip and barrier coatings and many more. Circle No. **140.**

Thermoplastic Formings

Falge Engineering Div., Pen-Mac-Nye Co., offers boxes of random samples of its containers, tube ends and caps of acetate, butyrate, Mylar, nylon. Stock dies for packaging parts number about 200. Also available, production parts for electrical and electronic industries. Circle No. **141.**

Reinforced Sealing Tape

Central Paper Co. is offering a sample book of its Glassweb (nonasphaltic) and Glasstex asphaltic case sealing tape. Tape is reinforced with glass fibres and is available in 5 colors. Circle No. **142.**

Cushioning Material

Kimberly-Clark's 4-page bulletin KKD49 describes Kimpak Super crepe, a new, low-cost cellulose cushioning material. It is suitable for cushioning a wide variety of products ranging from appliances to physicians' samples. Circle No. **143.**

Corrugated Packaging

Hinde & Dauch offers "How to pack it," a packaging guide with information on selection of proper corrugated packaging. The 32-page, illustrated book has two sections: one on basic corrugated box designs, the other on special designs. Such styles as regular slotted, telescope, and 5-panel are described and illustrated in the first section. The second section illustrates and details 56 box designs developed for special requirements. They range

Circle No. 265 on Card, Page 71

U.S.I. POLYETHYLENE NEWS

A series for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins

AUGUST, 1959 — U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corporation — 99 Park Ave., N. Y. 16, N. Y.

Packaging Notes

Helpful Hint: We've seen squares of polyethylene film being used to package lemon slices served with iced tea in restaurants.

The covering makes lemon squeezing more convenient and sanitary. It eliminates the problems of sticky fingers and lemon juice stains on clothes, and prevents contamination from handling. Small size tubing cut in proper lengths could be used for the same purpose.

Skim milk powder is being packaged in printed polyethylene bags. The bag holds three pounds of instant milk powder, the equivalent of 12 quarts of liquid milk.

The side-weld, pinch bottom polyethylene bag costs less than conventional foil wrapped boxes now generally used to package milk powder.

Cast polyethylene film made from U.S.I. PETROTHENE resins, is being used with success in two new applications:

A Texas manufacturer is using cast film bags to package tortillas. He reports that the bags are clearer and seal better than conventional wax paper bags. Polyethylene film reportedly provides longer shelf life for the tortillas and has virtually eliminated the problem of stale product returns.

Cast polyethylene is also being used to package hosiery. The clear, high gloss cast film has met with good consumer acceptance. The film is tougher than previous transparent materials used, and returns from damaged packages have been greatly reduced.

Both manufacturers report that use of polyethylene film has significantly lowered their packaging costs.

U.S.I. Wins Three Awards For Polyethylene Promotion

U.S.I. has won three top industrial advertising awards for its 1958 advertising and sales promotion campaign for PETROTHENE polyethylene resins. An important factor in all three awards was U.S.I.'s industry wide promotion of new markets for polyethylene and higher quality standards for products made of polyethylene.

The competitions in which U.S.I. was honored are: National Industrial Advertisers Association Best Seller Awards; The Putman Awards for Advertising Performance; and the American Business Publications Awards.

Imagination Creates New Markets, New Uses For Polyethylene in Sports, Vacation Fields

New Products, New Ideas for Using Film Add to Summer Fun Everywhere

Imagination — on the part of consumers as well as designers and manufacturers — has contributed to a virtually endless list of new uses for polyethylene that have been in evidence this summer.

Utility coverings of polyethylene, available in most hardware and paint stores, make ideal rainproof protection for boats, sports cars, and most anything else that is kept outdoors.

A survey of products designed for the leisure market shows that polyethylene's versatility has created major new sales opportunities in the sports and vacation fields.

Many Marine Applications

Polyethylene's water and corrosion resistance, for example, have been put to good use in products for beach and boating enthusiasts. Boat fittings and bilge pumps are being molded from polyethylene. Bait and fishing equipment boxes made from polyethylene are colorful, lightweight and waterproof. Deck brushes, made completely of polyethylene, including the bristles, do not rot or mildew in damp sea air, are easily cleaned. Ice buckets, thermos jugs, coolers, and picnic baskets are just a few of the great many new leisure time products that capitalize on polyethylene's durability and insulating properties.

Juvenile Market Important

Manufacturers have found that polyethylene serves the juvenile market well. Golf clubs with polyethylene heads, for example, are inexpensive and strong enough for youngster play. Backstops for backyard golf ranges and baseball batting cages are now made of polyethylene film.

Consumers Find New Uses for Film, Pipe

Consumers have thought up scores of uses of their own for polyethylene film.

House plants can be kept for weeks during the family's absence by wrapping them in film. And vacationers have found polyethylene film invaluable when they take it along on trips. As a temporary covering, it can serve for everything from an umbrella in case of showers to coverings for boats, sports cars, camping equipment, and outdoor furniture. It's handy at the beach for wrapping up wet beach clothes or for protecting the car upholstery on the way home. And for the home-improvement vacationer, polyethylene film can protect new lumber, fresh concrete, or even newly planted grass plots.

Polyethylene pipe is also coming into its own for all sorts of easily installed water supply and sprinkling systems.

This Is Only The Beginning

Molders and extruders are just beginning to exploit polyethylene's potential in this market. It gives promise of large volume sales as processors begin to promote its versatility and move it into sporting goods, camp supply, hobby, and do-it-yourself type outlets.

Polyethylene Film Reduces Highway Construction Costs

A Canadian construction company, which has just completed a 180-mile concrete super highway, reports using rolls of polyethylene film, both as a barrier between the fresh concrete and the gravel base, and as an overcovering.

Use of the polyethylene film eliminated concrete leakage into the gravel base, resulting in a seven percent saving in concrete. Slower curing gave a fifteen percent increase in concrete crush strength. The cover film, re-used more than 20 times, also substantially lowered labor costs.

Polyethylene Pipe Helps Form Ice Bridge Across River

In a unique application, cold brine circulating in polyethylene pipe helped form a natural ice bridge across a Canadian River. The "bridge" made possible the passage of trucks with 25-ton loads for a period of three weeks. The ice bridge was built up with water sprayed on top of the pipe to a three foot thickness.

Polyethylene pipe was chosen because of its low temperature flexibility. The "bridge" was removed after use by circulating warm brine through the pipes to melt the ice.

from simple 1-piece folder to an octagonal box. Circle No. **144.**

Washer-Rinser

U. S. Bottlers Machinery Co. has available an 8-page brochure No. 103047 describing its "Load-A-Matic" washer and rinser for single-trip containers that unscrambles and rinses on one machine. It will handle automatically any standard glassware with round or nearly round bases, also cone-top beer cans. Specification tables are included for various machine sizes. Circle No. **145.**

Polyethylene Coated Paper

Thilmany Pulp & Paper Co. has a pamphlet containing samples of some of its polyethylene coated papers, such as kraft-foil combinations, wax laminations, pouch papers, reinforced kraft. Several examples of black polyethylene coated paper are also included. Circle No. **146.**

High Speed Bubble Packaging

Erdco Engineering Corp. offers folder 58-2 which pictures and details its high speed automatic bubble packaging machine. It feeds, forms, loads, prints, dielectrically seals, and die cuts. Produces 60,000 pkgs./day with 12 cavity molds. The "Clear Pak Junior" for short run packages will produce a seal every three sec. It can be changed to different size in 10 min. Circle No. **147.**

Thermoplastic Acetal Resin

Du Pont offers three pieces of literature on its new thermoplastic "Delrin" acetal resin. An 8-page folder gives general background, results of field tests, and typical properties. "What is 'Delrin' and why can it compete with metals?" is the title of a 4-page brochure, and packaging ideas with "Delrin" are covered in another 4-page illustrated folder. Circle No. **148.**

Unscrambling Table

Climax Products Div., The Lodge & Shipley Co., offers bulletin T317, illustrating and describing its unscrambling and flow control table. Table is designed to handle glass, metal and plastic containers of various sizes and shapes. Circle No. **149.**

Polyethylene

Spencer Chemical Co. has available a 32-page product brochure discussing the characteristics, application and markets of polyethylene. Containing 27 charts illustrating the technical aspects of polyethylene properties and production, the book deals particularly with low and medium density materials. Circle No. **150.**

Wrapping Machines

Hudson Sharp Machine Co. offers a 12-page brochure on its automatic "Campbell" wrappers. Illustrations show a number of different models and the corresponding types of products each package-wraps. A cut-away illustration shows how the basic machine functions and diagrammatic pictures show types of seals and folds available. Circle No. **151.**

Expandable Polystyrene

Koppers Co., Inc., plastics division, has issued a 4-page brochure C-9-270 detailing the use of "Dylite" expandable polystyrene. Illustrations show application as shock-absorbent and water-proof pack for such products as electrical typewriters, clock radios, magnetrons; and as thermal insulator in packaging for vaccines, drugs and nitric acid. Physical properties of this lightweight plastic are included. Circle No. **152.**

Form-Fill-Seal Machine

Conapac Corp. has available a 4-page illustrated bulletin on the Formseal machine, an automatic packaging machine that forms any kind of thermoformable plastic film or sheet into various shapes of small containers, such as cups and boxes. It fills, seals and trims them in a synchronized operation, and automatically packages solids, powders, pastes and liquids into hermetically sealed semi-rigid containers. Circle No. **153.**

Multiple Shipments

Weber Addressing Machine Co.'s folder offers folder A-125 which discusses 49 marking jobs done easier and faster with Weber handprinters and label printing markers. Of interest to all companies who reproduce data from 5 to 1000 times for addressing and marking. Circle No. **154.**

Asphalt Carton

Gaylord Container Corp., Div. of Crown Zellerbach Corp., offers a 4-page folder on its sewn-bottom, one-piece asphalt carton. Shipped knocked-down-flat, the carton is set up for filling by slipping over a semiautomatic device designed by Gaylord. "Ears" at the sewn bottom are folded in and stitched by a single wire stitch. Circle No. **155.**

Electronic Control

Post Machinery Co.'s Electronic Products Div. offers details on the Post Decitron, model K-5, a multipurpose electronic control which eliminates vacuum tubes. It features a hermetically sealed, solid-state photocell, and a single-pole, double-throw relay (DC operated). Post says K-5 may be used as an "on-off," "go, no-go" control and will sense up to 1000 interruptions/min. Circle No. **156.**

Polyethylene Measurements

U. S. Industrial Chemicals Co. has available an 8-page technical bulletin describing a method of computing polyethylene bag and film measurements with a series of formulas and tables. Some of the formulas are for determining: ft. obtainable per lb. of film. Weight/1,000 ft. of film; weight/roll of film; average gauge of film; weight/1,000 bags; bags/lb. of film; and average gauge of bags. Circle No. **157.**

Explosive Bags

Bemis Bro. Bag Co. has an 8-page pocket-size booklet, "13 Questions and Answers," illustrating and describing its explosives bag constructed of Flexiply (crinkled-kraft paper) tubed around Bemis-extruded pinhole-free Red Line polyethylene. Booklet explains methods of filling and closing bag, proper loading techniques, performance and cost data. Circle No. **158.** (End)

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- TABLETS
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Book review

Pressurized Packaging (Aerosols)

By A. Herzka and J. Pickthall

Technical problems involved in pressurized packaging are highly complex and must be overcome before a given product can be satisfactorily packaged in this manner. As an aid to solving such problems, two of Britain's leading authorities on aerosols have authored "Pressurized packaging (Aerosols)," published January 5, 1959. It is a major contribution to literature on this subject.

Mr. Herzka is with the research department of The Metal Box Company, Ltd., London, and is in charge of aerosol development. With 14 years' experience with chemicals, he has done much research into pressurized packaging. A lecturer and writer, he is an Associate of the Royal Institute of Chemistry.

Mr. Pickthall is chief chemist for Polak & Schwarz (England), Ltd., Enfield, Middlesex and has had 34 years' experience in the perfumery and allied industries. Also a lecturer and writer, he is a Fellow of the Royal Institute of Chemistry and immediate past president of the Society of Cosmetic Chemists.

CONTAINS THREE SECTIONS

Totaling 411 pages, the single-volume, hard-cover book is made up of three sections, five appendices and three indices. The text points out some of the various difficulties which are likely to be encountered with this type of package, and suggests how they may be overcome. The book should serve as a useful reference for anyone working with aerosols.

The first section starts with a brief introduction, including an interesting history of the subject. Concluding this section, the second chapter covers method of operation, or the basic principle, of the pressurized package. **It describes the two- and three-phase systems used.**

Components And Techniques

Covering components and techniques, the second section contains 144 pages, broken down into four chapters dealing respectively with propellants, dispenser components, filling techniques, and laboratory evaluation. Under liquified gas propellants are listed many of the compounds of most interest. Such items as spray patterns, solubility, properties, etc., are discussed. Also included are chlorinated propellants and paraffin hydrocarbons. A portion of the chapter on propellants is devoted to compressed gases, such as nitrous oxide, carbon dioxide, and nitrogen.

Very thorough in its discussion, the chapter on dispenser components gives many details on aluminum, black-plate, glass, plastic, and tin-plate containers. Pointing out that the majority of valves may be classified into six broad groups, the authors describe at least one example of each group, as it would be impossible to tell about all of the numerous types of valves used. The six groups are: standard, foam, metering, toothpaste, one-shot, and powder types. Also included in this chapter are brief discussions on valve cups and protective caps.

The next chapter in this section gives many details in regard to filling techniques. Covering liquified propellants, the authors explain such techniques as low-temperature, ambient-temperature (injection), and the two-stage methods of filling. Pointers are given when using compressed gases for filling. The description of a filling layout includes information on such equipment as product fillers, cleaners, propellant fillers, sealers, leak-testing equipment, etc.

Concluding the second section is a chapter on laboratory evaluation. It presents extracts from a premarketing checklist drawn up in the United States, for planning and testing the proper pack for a given product. Although not complete, the list includes most of the important items which must be checked. The chapter describes apparatus and techniques necessary for conducting most of the tests listed in the checklist. It also includes methods for spray patterns, discharge rates, particle size analysis, flammability, moisture determination, internal pressures, and more. The various tests described appear to be quite complete and should be easily followed.

Formulations For Aerosol Packages

The last section in the book covers formulations of many types of products for use in a pressurized package. Some products discussed are foods, perfumery, cosmetics, hair preparations, insecticides, medicinal preparations, paints and varnishes, fire extinguishers, and others.

Comprising 176 pages, this section includes many formulas for the various types of products. Although it seems that there are more formulas than would be required in a book on the subject of pressurized packaging, the authors apparently felt it necessary in order to point out the many specific problems involved and how these problems can be solved. For instance, with hair preparations, they point out that several factors determine the amount of propellant to be used, one factor being flammability. They stress that certain ratios of alcoholic solution to

(*Continued on Page 86*)

Note No. 7:

Relationship of moment of inertia to stiffness of corrugated board

By K. Q. Kellicutt,
Engineer,
and C. C. Peters,
Engineer,
Forest Products Laboratory,
Forest Service,
U. S. Department of Agriculture,
Madison, Wisconsin

Introduction. In Note No. 6* of this series, the stiffness factor (EI) was used as an index to compare the relative stiffness, in bending, of various kinds of corrugated boards. It is obvious from this stiffness factor that a change in either or both the modulus of elasticity or the moment of inertia will result in a change in the stiffness of the corrugated board.

The modulus of elasticity of the paperboard composing the structure is an inherent property that results from the kind of fiber and the manufacturing techniques and processes employed in making the paperboard. The moment of inertia, however, is a property of the built-up structural material and varies with the dimensions and arrangement of its component paperboards. The arrangement of components is especially important in multiwall structural material, such as double-wall and triple-wall corrugated fibreboard.

In either of these two materials, the stiffest board will result by placing the heaviest, thickest liners of the structure on the outside surfaces. In so doing, the greatest possible amount of material is kept as far as possible from the neutral axis of the structure. This results in the highest moment of inertia attainable for the combination and, in turn, the greatest stiffness for the board.

In a single-wall construction, manipulation of the components is restricted because only two liners are used. As pointed out in Note No. 6, stiffness can be increased by using liners with a higher modulus of elasticity (E), heavier liner, or a larger flute.

Primary consideration is given in this note to the moment of inertia and its effect on bending stiffness. The reader should not, however, infer that, as the moment of inertia is increased, the resistance of a box to buckling loads necessarily increases in the same proportion. If two boards are made from component paperboards having the same modulus of elasticity, however, the board with the highest moment of inertia will provide the greatest resistance to loads superimposed on it.

Moment Of Inertia

Corrugated board is not unlike certain other structural materials, such as the sandwich construction consisting of two relatively thin facings bonded to a core. Like the thin facings in sandwich construction, the liners are the principal load-carrying components of the corrugated board. The core of a sandwich, like the corrugated sec-

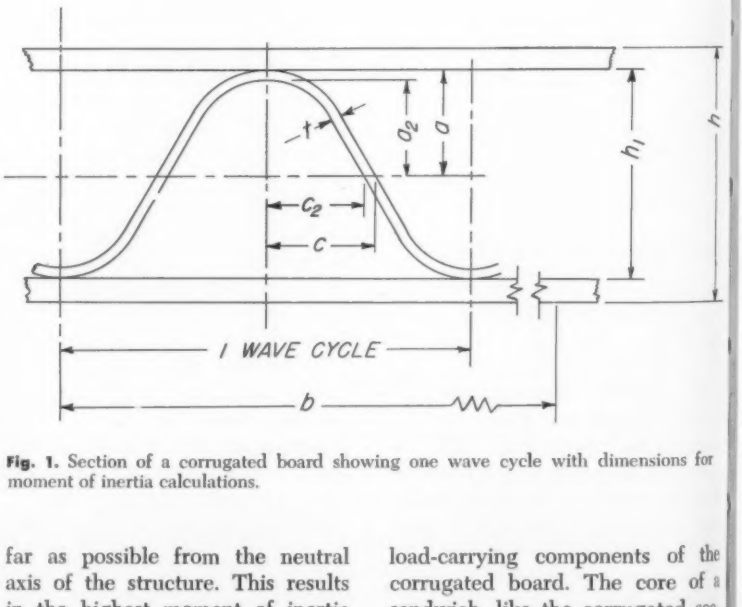

Fig. 1. Section of a corrugated board showing one wave cycle with dimensions for moment of inertia calculations.

*(Editor's note: Note No. 6 appears in the June, 1959 issue of PACKAGE ENGINEERING.)

tion of fibreboard, is usually a lighter weight material that contributes little to the stiffness of the sandwich; by spacing the facings or liners, it imparts stiffness and bending strength to the construction.

The corrugating medium, however, contributes appreciably less than the liners to the total moment of inertia of the built-up board. There are three principal reasons for this. First, there is only one corrugating medium in a double-faced, single-wall board as compared to two liners. Secondly, the corrugating medium is generally lighter in weight and thinner than the liner material. Third, and perhaps most important, is the fact that the material in the corrugating medium is disposed more closely to the neutral axis of the board than the liners.

The contribution of the liners and corrugating medium to the total moment of inertia can best be shown by some calculated values. To calculate the moment of inertia, the shape and configuration of the corrugated section must be assumed. This shape can be assumed to be elliptical or sinusoidal. For these calculations, it is assumed to be elliptical.

Several actual measurements of the board and its component parts are necessary to make the calculation, which consists primarily of calculating separately the moment of inertia of the liners and that of the corrugating medium. The two values are then added to get the total moment of inertia for the board.

Fig. 1 shows the measurements and values that are necessary. These are essentially the total thickness of the built-up board (h); the spacing between the liners (h_1); the thickness of the corrugating medium (t); the length of one wave cycle; and the number of corrugations per lineal ft. of board.

The formula for calculating the moment of inertia of the liners (I_l) as in.^{4}/in. is

$$I_l = \frac{1}{12} b\,(h^3 - h_1^3) \qquad (1)$$

where b is 1 in., h is thickness of board (in.), and h_1 is the space between liners (in.).

The formula for calculating the moment of inertia of the corrugating medium (I_c) as in.^{4}/wave cycle is

$$I_c = \frac{\pi}{4}(a^3 c - a_2^3\, c_2) \qquad (2)$$

where a is the distance from the inside surface of the liner to the horizontal centerline (in.); a_2 is the distance from the inside surface of the corrugating medium to the horizontal centerline; c is the distance from the outside surface of the flute to its vertical centerline, measured on the horizontal (in.) (taken as ¾ of 1 wave cycle + ½ t); c_2 is the distance of the inside surface of the flute to the centerline, measured on the horizontal centerline (in.) (approximated by $c-t$); and t is the thickness of the corrugating medium.

TABLE I

Moment Of Inertia Values For A Variety Of Experimental Kraft Liners And Semichemical Corrugating Mediums*

Kind Of Paperboard	Thickness (in.)	Weight (lb./1000 sq. ft.)	Moment Of Inertia (in.^{4}/in.)
Kraft liners	0.00721	25.9	0.000126
	0.01171	42.5	0.000215
	0.01713	60.8	0.000334
	0.02528	92.6	0.000535
	0.03097	117.1	0.000694
Semichemical corrugating	0.00378	9.8	0.000024
	0.00599	18.0	0.000035
	0.00814	24.7	0.000050
	0.01042	32.4	0.000061
	0.01397	45.5	0.000075
	0.01583	53.2	0.000083

* Values apply when fabricating liners and corrugating mediums to A-flute board having 0.180 in. between inside surfaces of liners.

Using experimental kraft liner that weighed 42.5 lb./1,000 sq. ft. in combination with a semichemical corrugating medium that weighed 24.7 lb./1,000 sq. ft., the moment of inertia for this A-flute board may be calculated as follows:

The moment of inertia for the liners (I_l) is found from Equation 1 and thickness values of Table I to be:

$$I_l = 0.08333\,(0.008417 - 0.005832)$$
$$= 0.000215 \text{ in.}^4/\text{in.}$$

when

$$h = 0.20342 \text{ in. (measured)}$$
$$h_1 = 0.20342 - 2\,(0.01171)$$
$$= 0.180 \text{ in.}$$
$$\tfrac{1}{2}b = 0.08333 \text{ in.}$$
$$h^3 = 0.008417 \text{ in.}$$
$$h_1^3 = 0.005832 \text{ in.}$$

Using Equation 2 and thickness values of Table I, the moment of inertia of the corrugating medium (I_c) may be calculated as follows:

$$I_c = 0.7854\,[0.000729 \times 0.08737 - 0.000549 \times 0.07923]$$
$$= 0.7854\,[0.000021]$$
$$= 0.0000164934 \text{ in.}^4/\text{wave}$$
$$= \frac{0.0000164934}{0.333} = 0.00005 \text{ in.}^4/\text{in.}$$

when

$$a^3 = 0.000729 \text{ in.}$$
$$t = 0.00814 \text{ in.}$$
$$a_2 = 0.09000 - 0.00814$$
$$= 0.08186 \text{ in.}$$
$$a_2^3 = 0.000549 \text{ in.}$$
$$c = (0.333/4 + 0.00814/2)$$
$$= 0.08737 \text{ in.}$$
$$c_2 = (c - t) = 0.07923 \text{ in.}$$
$$\frac{\pi}{4} = 0.7854$$

(*Turn page*)

$$1 \text{ wave} = \frac{12}{\text{No. flutes/ft.}} = \frac{12}{36}$$

$$= 0.333 \text{ in. for an A-flute.}$$

Combining the two moments of inertia,

$$I_{total} = 0.000215 + 0.000050$$

$$= 0.000265 \text{ in.}^4/\text{in.}$$

The calculated values show that the moment of inertia for the corrugating medium is small in comparison to that for the liners. Using the moment of inertia for the liners, together with a modulus of elasticity of 428,000 lb./sq. in.; and the moment of inertia for the corrugating medium, together with a modulus of elasticity of 333,000 lb./sq. in., the stiffness factor (EI) for the board may be calculated to be 108.6. This compares favorably with an actual stiffness factor of 110.2 determined from the bending test.

The corrugating medium in the above example is more than adequate in weight to develop the inherent stiffness of the liners. For that reason let us consider another experimental board consisting of an appreciably heavier kraft liner weighing 60.8 lb./1,000 sq. ft. in combination with a much lighter semichemical corrugating medium weighing 18.0 lb./1,000 sq. ft. The moment of inertia values for the liner and corrugating medium may be found in Table I to be 0.000334 and 0.000035, respectively.

The stiffness factor (EI) for this board was calculated as 155.0, compared to a test value of 152.7. Its total weight was 117 per cent of the total weight of the board with 42-lb. liners. Its stiffness factor from actual test, however, was 138 per cent of that of the lighter board. The total moment of inertia values for the two boards (0.000369 and 0.000265, respectively) also show that the inertia value for the heavy board is 138 per cent of the lighter one.

In actual practice, when mathematical analysis of this kind is impractical, a simple method may be employed that will at least partially insure the production of the stiffest box material. **The height of flute is one of the most effective factors in the moment of inertia. Hence, by specifying the maximum flute height that it is feasible to obtain, some control will have been accomplished.** *(End)*

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Our classified advertising section is intended for use by those wishing to buy or sell used packaging equipment, to employ packaging personnel, seek such employment, offer or seek business opportunities. It is not available for general advertising.

Pressurized Packaging (Aerosols)

(*Continued from Page 83*)

a given propellant will produce the proper amount of pressure, but that the spray may be flammable.

APPENDICES

The first appendix lists abbreviations used in the references, and a very good glossary of technical terms used throughout the book. Many trademarks mentioned are listed in the second appendix together with as much of their definitions and manufacturers as is known.

Appendix III contains a number of patents dealing with formulations. These are summarized briefly for easy reference. Appendix IV is made up of a short list of some of the various grades of industrial mentholated spirits available in Great Britain, and will probably be of little interest to most persons in the United States.

Has World Supplier List

Somewhat unusual and a worthwhile feature of the book, Appendix V contains a world list of suppliers of minimum requirements for producing pressurized packag-

es, and of contract fillers. Thus, one is able to find suppliers of various component parts in about 60 countries around the world, from Argentina to Yugoslavia. The only objection noted to this list is the fact that, where a company name appears more than once, the address is given only in the first reference. Thus, when one finds a company toward the latter part of the list, it is necessary to thumb back through the entire list until he finds the first listing. This should be corrected in future editions.

INDICES

The first index lists about 70 patents pertaining to pressurized packages, which are referenced throughout the text. **The author index** contains a listing completely cross indexed of all authors whose papers, articles, and/or books are cited in the text.

Containing 19 pages, the subject index is very thorough, covering all subjects from "Abbreviations" to "Zirconium oxide." Not only does it list such items as the different types of containers, valves, and other component parts of pressurized packages, but it includes every chemical name of propellants and the different types of products mentioned.

Errata

It must be pointed out that there are a number of errors printed in the back part of the book. It seems that mention of this fact should have been made in the front part of the book, such as an insert pasted on the flyleaf, since one might use the book for some time before discovering the errata on Page 388.

One highlight of the book is the use of many good illustrations. Totaling about 115, these consist of graphs, photographs, and diagrams. In addition, there are nearly 40 tables of data.

Published by Academic Press, Inc., Publisher (for the U. S. edition), 111 Fifth Ave., New York 3, N. Y., it is available in many bookstores at a cost of $12.00 per copy.—H.E.V., Jr.

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What we think

Make machine servicing fit your own needs

Visits with people who accurately tailor the care and maintenance they give their packaging machinery (to meet the needs of particular operations) convince us that far too many packagers blindly follow traditional maintenance patterns. Successful experience of countless companies in preventive maintenance draws attention away from what should be a major aim in machinery usage: Make the maintenance and care fit the exact needs of the installation.

It is time to get away from routinely following a "standard" maintenance program. While we would be the last to urge disregard of a machinery maker's maintenance advice and while we have often stressed proper maintenance, we think all this can be overdone. More plants should systematically study machine operations—to tailor maintenance to fit. Doing so can lead to surprising economies in better use of maintenance men and facilities.

Why long-run maintenance on short-run lines?

We should note the different uses and purposes of machinery. Multi-purpose, "flexible" machinery deserves a different pattern of care than specialized, single-purpose units. Production men dream of running day in and day out on the same package, but today's abundance of specialty products, changing items and short runs suggests that more often than not this is a dream rather than a reality.

So much of today's thinking about maintenance and lubrication is in terms of sustained production at high speeds—thus not geared to typical production experience. Result is that maintenance of lower speed, multi-purpose equipment often is overdone. Frequent changeovers for package size, product variations and run length subject these machines to proportionately more maintenance and lubrication than furnished to machines running for longer intervals at higher speeds.

Today's operating costs do not permit the luxury of overmaintenance, however well intended. It is like excessive protection built into structural and functional packaging. It performs well but is too much on the safe side of overprotection to be economical. Excessive maintenance is a waste of man-hours and facilities.

But at the same time, you cannot risk undermaintenance. Equipment is too expensive initially, and there are the incalculable costs of production not attained, packages not turned out—while machinery is down for repairs. The middle road course is to tailor the maintenance.

It is like walking a tightrope with a long, lead pipe in one hand and a bucket of sand in the other. The happy medium lies in a fairly narrow zone. Probably most companies are on the "over" side of this zone. Benefits and economies inherent in hitting it "just right" merit making the effort to do so.

Profitable goal: Setting up "ideal" maintenance

Reducing all this to practical terms suggests two key steps: (1) Know just what's best for your particular packaging lines and machinery, and (2) set up and correct *quantity* of maintenance effort to match your exact operational needs. Chats with experts who are making the effort to get this balance convince us that most companies play it safe, follow traditional maintenance programs.

Heart of the effort is an inquiring mind. Taking a new view of maintenance, challenging current practice, questioning traditional methods can be very worthwhile. Men who are striking out on new lines are finding they can operate effectively with less maintenance (particularly on multi-purpose lines and machines) than they once thought possible. And they are gaining these results without jeopardizing their equipment. Far more companies may find they can shake a lot of excess maintenance out of their operations and still meet all current needs. Today's costs make this shaking down process desirable—even mandatory.

Bruce Hollingsworth

Editor

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